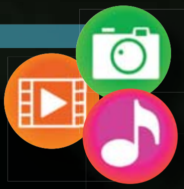

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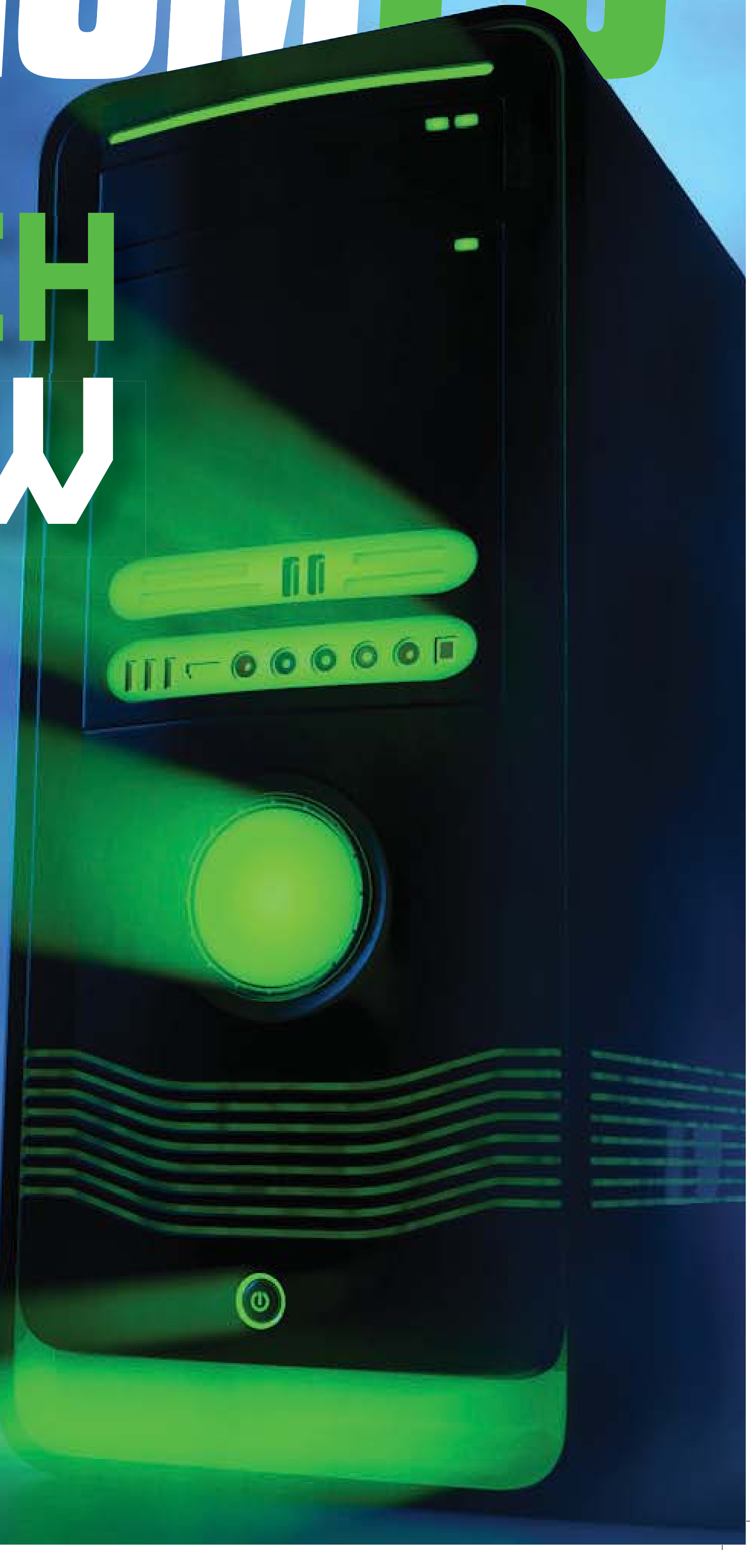

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Gordon Mah Ung

A PC IS...

IN BETWEEN MY chores as a hardware tester, I'm an IIBT board-certified troller and can successfully argue with anyone about anything, anywhere, at any time.

These days, one of the many issues I get to spar with people over is, "What is a PC?" That might seem about as basic as opining on the color blue, but the distinctions are extremely important. Just this morning, I was reading a headline stating that Apple's new mini tablet could very well "hurt the PC market." Of course, on the very same news site, six months ago, was a story about how analysts had deemed Apple the world's largest "PC maker." That's not because Apple sold more PCs than HP, Dell, or Lenovo, but because it sold more iPads, which as we know, should be counted as PC sales, right?

That's part of my frustration. It wasn't so hard to figure this out in the early days of computing, before the PC wiped out pretty much everyone except for Apple. Why is it so hard today?

In the strictest definition, a PC was an IBM PC running PC-DOS on an Intel x86 processor. That would later expand to a PC-compatible machine running MS-DOS on an x86 CPU. These days, I'd say, the definition is pretty liberal: any x86 or x86-64 machine running a stand-alone x86-compatible operating system. It doesn't even mean you have to run a Microsoft OS, but you should be able to install any compatible OS you want. After all, a ThinkPad running Ubuntu is as much a PC as a corporate "Wintel" box. And yes, I think that x86 boxes with secure UEFIs that don't let you install Linux or other alternative OSes fail to live up to the definition of a PC. And yes, the Mac is just an overpriced PC.

How does my litmus test work on today's hardware? Let's see. Is the iPad a PC? No, it's not x86 and it's pretty well locked down. Is it a personal computer? Yes. Is a Citrix terminal running Windows XP remotely a PC? No. Is it a personal computer? No, it's a terminal. Is your smartphone running Android 4.1 a PC? No. Is it a personal computer? Yes. Is a Windows 8 Pro convertible tablet a PC? Yes. Is Microsoft's new Surface tablet running Windows RT a PC? No. Is it a personal computer? Yes. Is a Google Chromebook a PC? If it's x86, then yes, but not when it's running Chrome OS. Why not? Chrome OS is far closer to being a terminal than a personal computer.

During the next few years, the lines will get blurred. The media will get confused. But I'm certain that if it looks like, smells like, and boots like a PC, I'll know it.

Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

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THE NEWS

Can Win8 Save Ultrabooks from a Sales Slump?

With the future of Ultrabooks in question, we examine whether or not Windows 8 is the answer PC makers are looking for

LIKE ANY OTHER electronic device, notebooks are evolving into smaller, lighter, and faster instruments with each new generation. It's the natural progression of things, and in an attempt to accelerate the process, Intel created the Ultrabook specification with a set of guidelines manufacturers must abide by in order to market their systems as such. In defining the category, Intel's executive vice president, Sean Maloney, boldly predicted that Ultrabooks would constitute 40 percent of the consumer laptop market by the end of 2012, banking on Moore's Law to make his prediction come true.

Well, here we are staring down 2013 and Ultrabooks have barely penetrated the struggling PC segment. Stuck in a sales slump, computer shipments are unusually slow for this time of year, and high-priced Ultrabooks are certainly no exception. Not only are Ultrabooks viewed as prohibitively expensive, but according to IHS iSuppli, PC makers have done a poor job marketing the category. These factors led to the research firm slashing its near-term Ultrabook sales forecast by 53 percent to just 10.3 million units.

Hybrid form factors haven't caught fire up to this point, but if Windows 8 is welcomed by the masses, convertible Ultrabooks like Dell's XPS 12 may finally find an interested audience.

On the bright side, component prices are falling, and by the time you read this, Microsoft's marketing machine will be in full swing promoting Windows 8 and the smorgasbord of partner products built to take advantage of the touch-friendly operating system. That includes Ultrabooks, but will it make a significant difference?

Craig Stice, senior principal analyst for Compute Platforms at IHS iSuppli, believes it will.

"I do think touchscreen technology can be a compelling feature for ultrathins and Ultrabooks," Stice told us. "We live in a touchscreen generation and it's become almost natural instinct for many users—used to their smartphones or tablets—to want to reach out and touch the screen."

Stice also sees the logic in the plethora of hybrids and convertibles being brought to market, which only serve to make the PC more competitive with mobile computing gadgets. However, not everyone we spoke with agreed with Stice's assessment about touch.

"We do not believe that touch will make sense on all form factors," Carolina Milanesi, research VP for Consumer Technologies & Markets at Gartner, explained to us. "While there is no doubt that touch is here to stay and that it has changed the way consumers interact with content forever… anything that would get you to stretch your arm out does not make sense."

Furthermore, Milanesi feels that touch or no touch, Ultrabook pricing has to come down for consumers to really show interest.

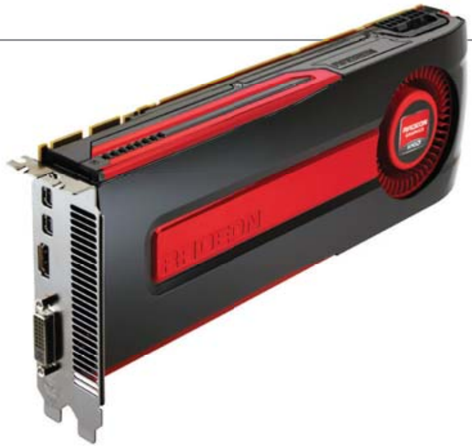
Providing some much needed optimism on the subject, Chaitanya Kumar Ammini, lead analyst with GBI Research, a leading business intelligence provider, expects Windows 8 to have a "significant impact on the sales" of both traditional notebooks and Ultrabooks.

"The decrease in notebook shipments in the past two quarters was primarily attributed to customers holding off to purchase products with the latest Windows OS," Ammini stated to *Maximum PC*. "However, GBI Research expects the sales to actually pick up in Q4, which is traditionally considered the best season for electronic goods sales due to the holiday discounts offered."

Ammini isn't worried that touch might add to the cost of Ultrabooks, insinuating that it could be offset by helping the category penetrate other market segments, like school children and college students.

Now that Windows 8 is shipping, we'll know soon enough who's right. **–Paul Lilly**

Buy AMD Card, Get AAA Games



AMD is trying to move some of its 7-series GPUs this holiday season, and to help them out the door the company is bundling several AAA titles including Far Cry 3, Hitman: Absolution, and Sleeping Dogs, as well as a 20 percent discount on Medal of Honor: Warfighter. To sweeten the pot even *further*, the company released a new graphics driver—version 12.11—that promises to squeeze significant performance improvements from its cards. The promotion is called "Never Settle by AMD" and it will be running all the way into 2013 for any 7-series GPU.

Here's how it works: Buy any AMD 7-series card (Newegg, Amazon, brick-and-mortar, etc.) and you'll get a coupon for up to three games. If you go top-of-the-line 7900 series, you get all three games, plus MoH at a discount. If you go 7800 series, you get two games and the discount. 7700 series nets you one game and the discount. For more details, check out bit.ly/RQh7hl. **–JN**

Lenovo Beats HP in PC Sales—Maybe

One major research firm claims that Lenovo has finally leapfrogged HP to become the world's top PC supplier, while a second firm still has HP ranked on top.

According to Gartner, Lenovo took a slight lead over HP in Q3, shipping over 13.7 million PCs for a 15.7 percent share of the PC market. HP shipped more than 13.5 million PCs for a 15.5 percent share. Dell (10.5 percent), Acer (9.9 percent), and Asus (7.3 percent) round out the top five spots.

According to International Data Corporation (IDC), however, while Lenovo indeed owns a 15.7 percent share of the market, HP still edges out its rival with a 15.9 percent share. Even that might be short-lived. In the third quarter of 2011, IDC had HP ahead of Lenovo by 4.3 (17.4 percent versus 13.1 percent), a lead that's now been reduced to two-tenths of a percent. **–PL**

Logitech Introduces Touch Peripherals

Logitech has three new touch-friendly peripherals for Windows 8 that make it easy to interact with the Metro UI from your physical desktop.

Perhaps the most intriguing is the Touchpad T650 ($80). It connects to your computer via USB or with a wireless dongle. It supports Windows 8 gestures, so even if your monitor doesn't support touch, you can still perform functions like pinch-to-zoom and three-finger swiping (to return to the Start screen). Logitech's Touch Mouse T620 ($70) sports a full touch-surface with support for six touch gestures. The Touch Mouse T400 ($50) is more like a traditional mouse, but with a dedicated touch zone that supports three touch actions. **–PL**

Tom Halfhill
Fast Forward

THE HIGH COST OF CUSTOMIZATION

LONG AGO, all men's suits were handmade by tailors. Then mass production made off-the-rack garments more affordable, and now only the wealthy or fastidious buy fully tailored suits. A similar trend has transformed the semiconductor industry, making custom microprocessors a luxury only for well-heeled companies.

Crucial difference: Whereas custom suits are one-off designs, custom chips must be produced in large volumes to justify the high design costs and manufacturing-startup expenses. Apple's A6 application processor in the iPhone 5 is a good example.

The A6 is no larger than a postage stamp, but it probably cost more than $500 million to get the first chip out the door. Yep, that's half a billion dollars for a processor that beats a competing design from Samsung by about three months and will be obsolete in about two years. Yet, for Apple, it may be a good investment.

Here's the breakdown. In 2008, to acquire more engineering expertise, Apple paid $278 million for PA Semi, a Silicon Valley startup. Apple didn't want the company's processors—just its design experience. Next, in 2010, Apple spent $120 million for Intrinsity, a startup specializing in high-speed circuit design.

Then, to design the ARM-compatible A6, Apple needed an architectural license from ARM, the British company that owns the architecture. The license probably cost at least $10 million. Finally, Apple had to design the chip, verify it, and pay for the mask sets and other fabrication-startup costs. That's another $100 million or so.

Total: about $508 million. And that's just for a few test chips. Apple outsources production to an independent foundry, incurring more expenses for the finished chips and for royalties to ARM.

Apple has the resources and sales to justify a custom-tailored processor. Most companies must be satisfied with off-the-rack chips—even if their fit isn't quite perfect.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Thomas McDonald

Game Theory

DYING TO LIVE

PLAYER DEATH is not a gameplay element. It's a design failure. I know this is heresy among gamers with fond memories of Rogue and similar games, and for modern gamers who soiled themselves with glee over Dark Souls, but it's the truth.

This mechanic may work in some puzzle games, such as Limbo, which incorporated character death into a puzzle format and narrative structure that made sense. But that's an exception. The problem is this: With an adventure, role-playing, or action game, the gamer becomes the character. He identifies with it. He's developed it. *And that's the point of the game*: Take one person, see him through various trials, gather what needs to be gathered (experience, weapons, objects), and then use that accumulated knowledge to win.

Character death is a betrayal of that format. It means that this character—the player's game-world surrogate—*has died.* He's not pining for the fjords. He's passed on. He's joined the choir invisible. He is an *ex-character.*

Designers need to keep in mind that they're dealing with a narrative format, and character death is the end of that character's story, unless we're dealing with zombies, in which case Rick Grimes will amble along shortly, and, with a pained but determined expression, shoot 'em in the brain.

I've now had the second game in as many months with this serious design flaw. Dishonored is the latest. It is a game with many things to recommend it. I started the game by just cutting my way through the enemies, and after the first level I learned that the ideal way to play it (according to the designers) is as a stealth game in which nobody dies.

The way the game is designed, however, this is not possible without repeated reloads and restarts. Other stealth games (Splinter Cell, Thief) give you enough tools and clues to do this. Dishonored does not. It requires trial and error, and that's a problem when the result of error is death. There are no reloads in life.

You can follow Thomas McDonald on Twitter: @StateOfPlayBlog.

Ultra HD TV Spec Formalized

Now that you've finally upgraded to an HDTV, your big screen is officially obsolete. The Consumer Electronics Association has spelled out a 4K spec for the next-generation of televisions, if manufacturers want their sets to carry the Ultra HD label.

Ultra HD sets will have a minimum resolution of 3840x2160 pixels, with an aspect ratio of 16:9. The sets must also have at least one digital input that supports native 4K video without relying on upscaling. The CEA says Ultra HD sets are expected to be on display at the annual CES electronicasm held every January in Las Vegas. **–GU**

Chromebook Redux: ARM Aboard

If Google's line of Chromebooks hasn't caught on, blame the CPU. That seems to be the thinking now that Google and Samsung are pushing an even cheaper Chrome OS-based notebook using an ARM chip instead of x86.

The newest Samsung Chromebook features Samsung's Exynos 5250 CPU, 2GB of RAM, an 11.6-inch screen, and is "ultra-thin" but obviously not an Ultrabook. The ARM-based Chromebook finally breaks the $300 price barrier, with the Wi-Fi-only version costing $250. Compare that to the older Atom-based Samsung Series 5 Chromebook at $350 and the "performance" Samsung Series 5 550 with a 1.3GHz Celeron at $450. **–GU**

Hitachi Fills Its Drives with Helium

When we think of ways to increase hard drive capacity, we've rarely considered the air inside the hard drive as being a limiting factor, but it is. The air inside creates drag on both the spinning platters and the heads hovering over them, lowering performance and requiring more energy to keep everything spinning. To ease this burden, Hitachi has spent six years researching how to use helium, which is one-seventh the density of regular air, as an alternative. Helium is so thin that it produces less drag and reduces turbulence inside the drive, so the drive's motor doesn't have to work as hard to spin the platters and move the heads. Since the platters and heads can be moved much more easily, the platters can sit closer together and the data on the platters can be packed tighter, resulting in drives with up to seven platters instead of the current limitation of five. This should translate into a capacity increase of up to 40 percent in the years to come, with the added benefit of consuming less power, as well, since the drive won't have to bust its hump as much.

Though the drives won't look much different from today's air-filled drives, they will be physically stronger since they are hermetically sealed to keep the helium inside. Current hard drives include a breather port that equalizes air pressure inside and outside of the drive. Hitachi has stated that the drives will come to market in 2013—we can hardly wait. **–JN**

Today's air-filled drives have breather holes, but helium-filled drives are hermetically sealed.

Quinn Norton
Byte Rights

IN OUR OWN BACKYARD

FROM TELLING Iran they shouldn't torture quite so many bloggers to complaining about China hacking Google, America is big on pushing Internet freedom around the world these days. Even before the Arab Revolutions, ensuring Internet freedom was an official foreign policy objective. But you know what would make us more plausible advocates for a free Internet? If we had one.

We're the ones seizing domains without legal cause, negotiating secret treaties to restrict technology and provide for cutting off Internet access for undesirables—all of this in the name of copyright enforcement. And the most routine censorship of free speech on the net? Misused DMCA requests for which there is no penalty and little redress—the same DMCA we're trying to push on countries we also criticize for restricting their citizens' speech.

While we were pushing Twitter to delay maintenance during Iran's Green Revolution, and funding tools for Chinese and Middle Eastern bloggers, American companies were selling those governments censorship and digital-spying hardware and software so they could catch those bloggers and attach car batteries to their nipples. Much of that technology was originally developed for domestic use—to let American rights holders police copyright on the net, and ISPs rate-limit competing technologies.

So when we scold countries about Internet freedom, we look kind of like a parent trying to lecture a teenager about drugs while hiding our pot stash behind our back.

We're Americans. We should be pushing for universal freedoms, but not until we can lead by example and show that a free Internet isn't something we're scared of here. Americans should be demanding their rights online—why would we settle for less from our government?

Before our government goes telling everyone else to put down that firewall, we've got a few things to clean up on our side of the fence.

Quinn Norton writes about copyright for Wired News and other publications.

Win 8 Gets Xbox Music

Microsoft has taken the wraps off Xbox Music, a streaming music service exclusive to Windows 8 and Windows RT device owners. It's being billed as the first all-in-one music service, and it one-ups streaming services like Spotify by giving Windows 8/RT PC and tablet owners the ability to play specific songs on-demand without having to pay a subscription fee. Microsoft says its music catalog extends to tens of millions of songs (over 30 million), all instantly available to stream and/or to create an unlimited number of playlists.

Xbox Music users will have the option of purchasing their favorite singles or albums from the Xbox Music Store. There will also be a subscription-based Xbox Music Pass option that runs $10/month, which gets rid of ads and allows you to download songs for offline playback. You'll also need this option if you intend to use the service on your Xbox 360 console (plus a Live Gold membership) and/or Windows Phone device. **–PL**

OWC Offers First 1TB SSD

If you're holding out for SSDs to get just a little bigger before you make the move on your system, OWC's new Mercury Electra 3G Max 960GB might convince you.

To create the first consumer 1TB SSD, OWC had to make a few side steps. The drive is a 3.5-inch form factor, but inside it's actually two 480GB SSDs in RAID 0. Also, the interface is limited to SATA 3Gb/s using a Sand Force SF-2181 controller. As you'd expect, it costs a bundle: a smooth $1,118 compared to $492 for one of the company's 480GB SSDs. **–GU**

Star Trek Electronic Door Chime

Need a way to be alerted that someone's entering your man cave while also preserving your nerd credibility? Consider Think Geek's Star Trek Electronic Door Chime ($30, www.thinkgeek.com). A replica of the 23rd-century intercom system from the NCC-1701, this door chime features motion detection that triggers either a swoosh or red alert, as well as a button that activates a hailing frequency sound. **–GU**

GEEK TESTED & APPROVED

THE LIST

6 CONVENTIONS ALL NERDS MUST ATTEND ONCE

6 COMIC-CON

The big studios have moved in, but if you want cosplay mixed with gaming, sci-fi, and a healthy dose of comics, Comic-Con continues to be a must-make pilgrimage for nerds.

5 PAX

The Penny Arcade Expo (PAX) has developed into *the* celebration of all things gaming and a crush of nerdmanity, too.

4 CAX

Take a couple hundred coin-ops, rent out a convention center, and you get the yearly arcade convention known as California Extreme, or CAX. Best part: All machines are set on Free Play.

Image credit: numb3r

3 THE STAR TREK CONVENTION, LAS VEGAS

What happens on Ceti Alpha V, stays on Ceti Alpha V.

Image credit:Mild Mannered Photographer

2 DRAGON*CON

Southern nerds who still won't travel north or west because of Sherman's March should consider Dragon*Con.

Image credit: VladeB

1 MAKER FAIRE

Robotics—both real and in mock-up R2 units—make this the thinking nerd's con.

Image credit: Istolethetv

HEAD TO

BY JOSH NOREM

Stardock Start8 vs. Classic Shell

Most power users would be perfectly willing to upgrade to Windows 8 if it weren't for two things—the tile-based "Metro" interface and the missing Start button. While Metro is like a rash in that you eventually get used to it, we can't imagine getting used to the lack of a Start button. It's too bad Microsoft didn't give us the option of using both features, but fortunately, two third-party utilities do. If you want the speed of Windows 8 and your old buddy the Start menu, one of these utilities belongs on your system. Let's find out which one.

Round 1: Installation

The Start8 install begins with choosing which style of OS to use for the Start menu, what the button looks like, and options relating to the behavior of the start menu. Once you've made your choices, the Start menu reappears and you're ready to compute. Classic Shell, on the other hand, is much more old school and feels like a registry-tweaking program from five years ago. Once you've selected your Start menu style—Classic, XP, or Vista/7—you can choose whether you want to have the classic look be applied to four areas of the OS—Explorer, Start menu, IE9, and the Windows Shell. From there, it installs and—voilà—the Start menu has returned. Both applications offer a hassle-free install, so we're calling this one a tie.

Winner: Tie

Round 2: Options

Both apps offer a plethora of configuration options, but Classic Shell offers more tweaks while Start8's are easier to digest. For example, Start8 presents you with easy-to-use menus that let you choose between bits and pieces of Windows 7 and Windows 8 UI features, such as using the Windows 7 Start menu but opening Metro when the Windows key is pressed on the keyboard. But Start8 only offers two configuration panes with a handful of options in each. Classic Shell offers similar configuration options but lets you tweak every variable imaginable, presenting you with a wall of radio buttons that will instantly bring you back to the days of hacking the delay time for menu animations and other UI tweaks. When it comes to sheer number of options, Classic Shell wins hands-down.

Winner: Classic Shell

Round 3: Functionality

Though Classic Shell wins the prize for offering the most options, Start8 is easier to use since everything is presented in a more sophisticated and simpler manner. Plus, since it costs money, Start8 has a lot more polish (as expected) compared to the freeware Classic Shell. Both apps easily walk you through the Start menu selection process, but once you're on the other side, Start8 gives you easy-to-understand options and basic tweaks required for an enjoyable Windows experience, while Classic Shell drops you into the deep end of the radio button pool. Both apps offer roughly the same options, and both let you use a Classic Start menu and access Metro, so there's little functionality lost between the two. We're choosing Start8 though, because it gives us the options we want in an easier-to-understand interface.

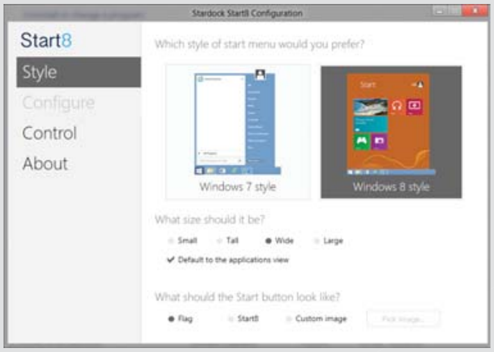
Winner: Start8

Round 4: Ease of Use

At this point the winner of this category is hopefully quite clear, as Start8 is much easier to use and configure than Classic Shell. This is not to say Classic Shell is like a Rubik's Cube or something, impossible to decipher and poorly coded. It's not at all, it's just that we've gotten used to UIs that are a bit more intuitive than the "classic" menus we used to wade through into the wee hours of the morning. The downside to Start8's simplicity and ease of use is that it has fewer options than Classic Shell, but we're fine with that. Classic Shell also has a "simple" mode that offers just basic tweaks, but once you dive in deeper, things can get somewhat confusing.

Winner: Start8

HEAD



Stardock's Start8 is easy to use and lets you pick and choose from a mix of Windows 7 and 8 Start menu styles. It's well worth the $5.

Classic Shell is open-source and free to download, and brings back all the Start menu options of yore, including a Windows XP Start menu.

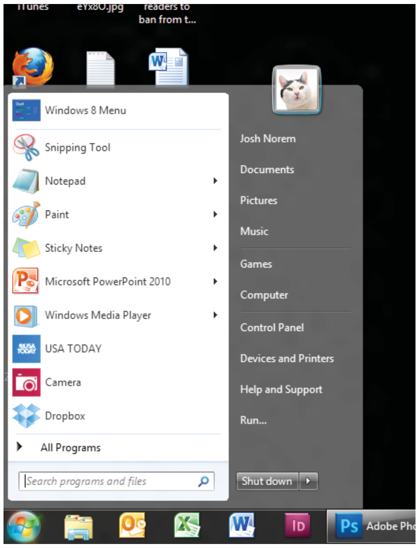
Round 5: Price

This category is pretty cut-and-dried, as Classic Shell is free and Start8 costs $5. In the name of rational decision-making, we're calling this one for Classic Shell, but also feel the need to point out that $5 is still a great price for Start8, as it may just be the best bang-for-your-buck piece of software Windows 8 users ever install. We're not sure at this early stage how popular, or unpopular, the Windows 8 Metro UI will be, but our guess is that a lot of people will miss the familiar Start button, making these apps essential. And Start8 feels like a fully formed piece of commercial software, whereas Classic Shell is as rough around the edges as you would expect. We're not complaining—it is free, after all—but one look at it and you know it's freeware.

Winner: Classic Shell

And the Winner Is...

This is a nail-biter, because both of these apps execute their primary mandate quite well while being easy to navigate and totally affordable. If you just want your old Start menu back, Classic Shell offers a quick and easy remedy to your dilemma, and the fact that it's free removes all risk from the decision to try it. That said, we prefer **Start8** even though it costs $5, because it is so polished that it looks and feels like a Windows Power Toy, and we like being able to open a mini version of Metro, too. It's also easier to use and configure, and provides more than enough functionality to justify its price.



DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> XP vs. Windows 7
> Upgrading from LGA1366
> PhysX on AMD

Pondering a $500 Upgrade

My laptop is an Asus G74SX-TH71. It has a GeForce GTX 560M with 4GB of RAM, a 2GHz Core i7 CPU, and 12GB of RAM. It has two 500GB hard drives in it, one for OS and games and the other for videos. I was wondering if I should upgrade my laptop to a desktop. I have about 500 dollars and I'm looking for a good budget gaming computer with a monitor. Can you suggest a computer or a way to upgrade my laptop, maybe an SSD?

—Mridul Sarkar

THE DOCTOR RESPONDS: Mridul, you're not going to get a desktop and monitor for $500 that's better than your year-old gaming laptop. If you want to speed up your laptop a bit, you could get an SSD, like a Samsung 830 Series, for your OS and games. That will dramatically increase startup speed and load times. You can get a 512GB version for just over $500. Alternately, you could spend some money on an external monitor; you can get a decent 24-inch IPS panel for under $300 these days. Or you can save that $500 toward a new desktop later on, when you have more money for a more powerful rig.

XP or Windows 7?

I am going to be building a new rig in the next month or so and wanted to know what, if any, performance hit I will incur or features I might miss by using Windows XP. I still prefer XP over Win7 and re-read your articles from 2009 on the pros and cons of each. I use Windows 7 at work and on my laptop but I like XP because I've spent so much time customizing it. I have it on my current rig, which is about two years old. It's not the dollars, I'm just sick of the Microsoft ball and chain of having to upgrade for little reason other than some major feature or two.

I plan on building an Intel Ivy Bridge rig. I'm not a big gamer anymore but do want to play on occasion. My main use will be video work: copying, transcoding, a little editing, and storing all my movies on my server. Plus audio, mainly MP3s. It's OK if I lose a little bit of performance but I'm really interested in what features I may miss—USB 3.0 and SATA 6Gb/s being my major concerns. Oh wise sage, what say ye?

—Scott Marion

THE DOCTOR RESPONDS: Windows XP was a great OS, but its time has passed. Windows 7 is much more secure and (more importantly) is being patched and updated regularly as new vulnerabilities are detected. Also, if you're doing video work, you'll want a 64-bit OS so you can utilize more than 4GB of RAM, and while 64-bit XP was atrocious, 64-bit Windows 7 is excellent. Win7 also has better driver support, and many USB 3.0 controllers and SATA 6Gb/s controllers don't work in XP. Not to mention, of course, that Windows XP is limited to DirectX 9, so unless you want new games to look like old games, you'll want 7's support for DirectX 10 and 11.

Of course, we could tell you to go for Windows 8 and be even more up-to-date. But it sounds like baby steps are what's needed here. Go for 7. It's a great OS, and there's still plenty of customization you can do to it. We miss theming XP too, but not enough to go back.

Stuck for Upgrades

My PC is running a Core i7-970, Asus Rampage Formula III, 12GB DDR/1600 RAM, a GeForce GTX 680, OCZ RevoDrive X2 110GB, two Seagate Barracuda 500GB drives, and a Sound Blaster X-Fi Titanium Fatal1ty Professional. I am stuck between upgrading to Z77 or X79. I'm afraid to go LGA2011 for fear that Intel will do the same thing to the socket as it did with LGA1366. I am debating between an i7-3930K and an i7-3770K. Either way, I have to shell out for a new motherboard and memory unless my current memory doesn't matter for doing quad channel on the new chipsets. I have a Thermaltake Mozart TX case, so I have plenty of room for parts. I currently have three 12cm fans blowing 110cfm airflow on my MB, RAM, and GTX card and 1x 12cm 110cfm fan for exhaust. What does the Doctor recommend?

—Nathan Hungerford

THE DOCTOR RESPONDS: After Ivy Bridge-E comes out of hiding from its undisclosed location next year, LGA2011 will indeed go the way of LGA1366. But that doesn't mean you should go Z77. LGA1155 is also dead after Ivy Bridge; Haswell will require a new LGA1150 socket. So, what's a builder to do? The Core i7-970 is still a good CPU, you've got plenty of RAM, and your GPU is, obviously, top-notch. Unless you're finding yourself starved for CPU power all the time, our advice is to wait for Haswell to change platforms.

As to your other question, RAM channels are chipset/CPU dependent, not RAM dependent. As long as your

↘ submit your questions to: doctor@maximumpc.com

RAM is compatible with the mobo, you can generally reuse it in a quad-channel board and get quad-channel memory as long as you have four DIMMs.

5-Pin Header: Huh?

I recently built an HTPC with a Lian Li PC-V354A case. I have it paired with an Asus F1A75-M PRO/CSM motherboard. The Lian Li case has a fantastic front-mounted SD card reader. My problem is that, during the build, I realized I have never seen this type of connector before. I don't see a 5-pin single-row connector on my board. Did I not properly research my motherboard choice? Am I missing this port? Am I just overlooking it? If I am missing the port, is there an add-on card that I can buy? I'm running an AMD A8-3870K with integrated graphics, so none of the expansion card slots are populated.

—Diedrich Guenther

THE DOCTOR RESPONDS: That is just half of a USB 2.0 internal header. Normally, a USB 2.0 internal header controls two USB ports, so a single set of pins will control one. Or, in this case, a media card reader. You will notice one of the five pins is not populated; that corresponds to the blank pin on the motherboard connector. Plug it into the top or bottom row of one of your motherboard's internal USB connectors (make sure *not* to plug it into the FireWire connector) and it should be fine.

PhysX on AMD?

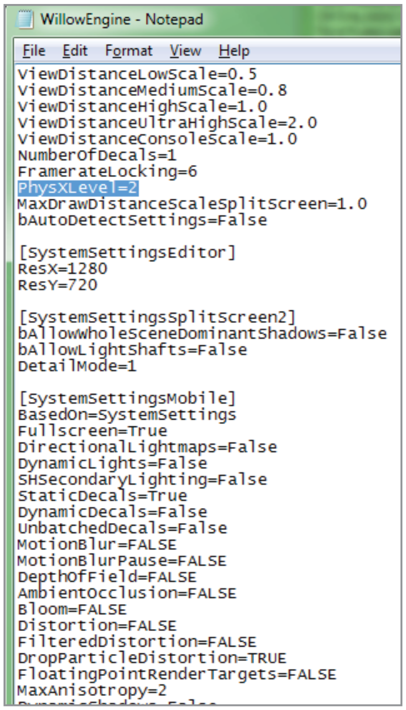
I just built a new gaming system a few months back with a Sapphire Radeon HD 7950 GPU. Now that Borderlands 2 has come out, I'm missing out on all the cool PhysX effects. After doing some research to see if I could still get a standalone PhysX card, I have been hearing of players with AMD cards using Nvidia cards as dedicated PhysX cards for gaming. I was wondering how you would do it, and what type of card would be best to use without overheating your system, and killing your PSU.

—David Yocabet

THE DOCTOR RESPONDS: There have indeed been hacked drivers that let owners of AMD GPUs use a secondary Nvidia card as a PhysX card, but they don't seem to have been updated in a while. Fortunately for you, a little config-file editing will let you enable physics effects in Borderlands 2 without using an Nvidia card at all. This doesn't work with most games, so give Gearbox some props for including it.

Go to your Documents folder (in Windows 7, that's C:\Users\[username]\Documents\) and then go to My Games\Borderlands 2\WillowGame\Config and select WillowEngine.ini. It's a good idea to make a copy of this before you change anything; call it WillowEngine.bak or something. Open the file in Notepad or another plaintext editor and search for PhysXLevel. It will be set to 0, since you have an AMD GPU. Just change this to 1 (for Low PhysX) or 2 (for High PhysX) and save the file. Launch Borderlands 2 again and PhysX should be enabled.

Watch out, though: Since you don't have an Nvidia GPU to render PhysX, it all has to be rendered on the CPU side. Borderlands 2's physics effects are pretty heavy, so this can drop your frame rate by quite a bit. You've been warned!


WillowEngine - Notepad
File Edit Format View Help
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ViewDistanceHighScale=1.0
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MotionBlurPause=FALSE
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Bloom=FALSE
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FilteredDistortion=FALSE
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FloatingPointRenderTargets=FALSE
MaxAnisotropy=2
```

It's easy to enable PhysX in Borderlands 2—even without an Nvidia GPU.

AD

THE FU

BY THE MAXIMUM PC STAFF

REVE.

MAXIMUM PC'S 2013 TECH PREVIEW

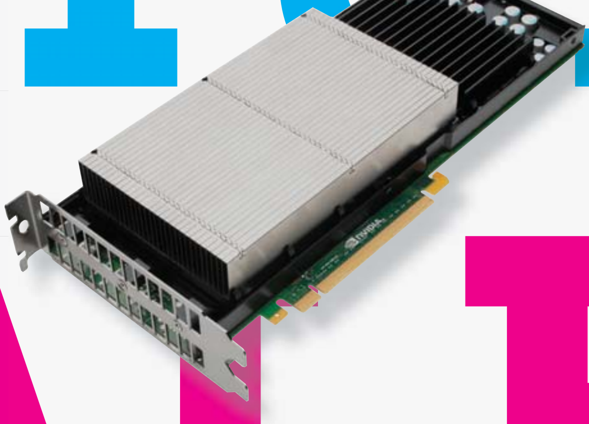
TECHNOLOGY DOESN'T MARCH ALONG—IT MOTHER-FRAKKIN' SPRINTS LIKE USAIN BOLT WITH A PACK OF HUNGRY ZOMBIES ON HIS TAIL. NEXT YEAR WILL SEE SOME FAIRLY BIG CHANGES TO THE PC ECOSYSTEM. THE MAINSTREAM TECH MEDIA WILL CONCENTRATE MOSTLY ON WHAT'S HAPPENING WITH MOBILITY NEXT YEAR, WITH AN ONSLAUGHT OF NEW WINDOWS 8 TABLETS AND CONVERTIBLES ON THE HORIZON.

MEANWHILE, BACK IN THE REALM WHERE PEOPLE DO ACTUAL WORK, THE DESKTOP PC WILL CONTINUE TO FLOURISH. WE'LL SEE INTEL'S MOST IMPORTANT CHIP RELEASE SINCE THE ORIGINAL CORE 2 DUO, AND WATCH AS AMD TRIES TO CLAW ITS WAY BACK WITH A NEW FX CHIP.

NEXT YEAR WILL ALSO SEE THE GRAPHICS WAR BETWEEN NVIDIA AND ATI RAGE ON, SSDS GET ONE STEP CLOSER TO EMANCIPATION FROM THE SATA PORT, AND POSSIBLY 4K MONITORS THAT YOU CAN ACTUALLY PURCHASE.

NO MATTER WHAT, TAKE A DEEP BREATH, DRINK SOME WATER, AND PREPARE TO JUMP BACK ON THE PC TECHNOLOGY TREADMILL, BECAUSE IT AIN'T OVER YET. NOT BY A LONG SHOT.

UTURE



ALED

INTEL'S NEXT TOCK

THE CHIP GIANT PLANS TO BRING THE PAIN TO COMPETITORS ACROSS THE BOARD NEXT YEAR

IN THE COMING MONTHS, Intel partisans will get two significant offerings: The biggest change will be the CPU known as Haswell.

It's a "tock" in Intel's so-called "tick-tock" design parlance, and therefore a more substantial advance in processing. Remember, the bigger leaps, or tocks, are offset from the manufacturing process changes. So, while you might expect the debut of a smaller process to yield a really butt-kicking CPU, that's not how the conservative company operates.

Intel instead pioneers a new process with a modestly improved CPU—a "tick." Only after the new process version is fully vetted and working with that chip does Intel decide to push performance, with a "tock." For example, the original groundbreaking Core 2 CPU was built on the same existing and well-tread 65nm process technology Intel had been using for the Pentium 4. And when Intel made the switch to 45nm, it debuted with a conservative jump ahead with the Yorkfield and Wolfdale CPUs.

With its 3D 22nm CPUs now well-proven in the Ivy Bridge series of Core *ix* chips, Intel is going to swing for the fences with Haswell. Also built on the 22nm process, Haswell features more transistors in increasing parallelism for single-threaded applications and more efficient multithreaded code. But don't think Haswell is going to a six-core CPU or an eight-core package like AMD's new Vishera (see page 25 for info on that), to say nothing of a 12-threaded jobbie like the Core i7-3960X. For its mainstream CPUs, Intel's guiding principle will be to push performance-per-core rather than increase core or thread count. So expect Haswell to come in the form of quad-core with Hyper-Threading, quad-core without Hyper-Threading, as well as dual-cores with HT on and off.

Lest you doubt that Intel can produce a performance boost worthy of a "tock" without increasing core or thread count, Intel says it can by extracting more performance out of existing code and making it easier to code for multicores. Haswell features deeper buffers, more execution units, improved branch prediction, increased internal L2 bandwidth, and two sets of new instructions intended to increase performance.

AVX2

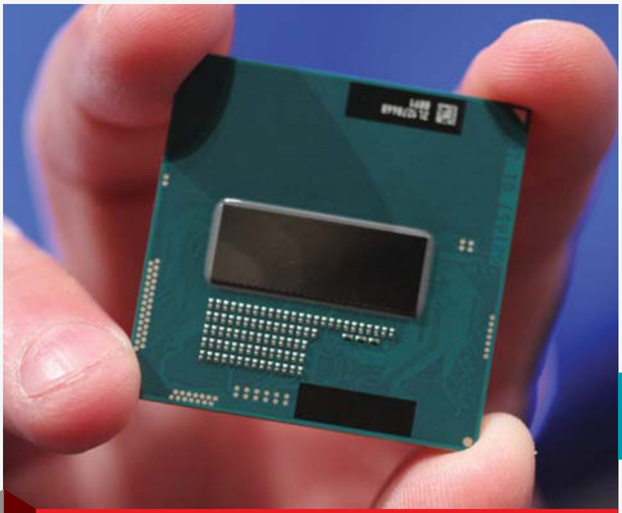
Just about every nerd knows that high-performance computing loads can benefit greatly from the GPU's inherent strengths in processing many parallel tasks. Even Intel has finally taken graphics seriously and its integrated graphics have gotten surprisingly powerful for not just gaming, but also compute purposes. But old habits die hard and Intel apparently doesn't want to cede compute performance to the GPU just yet. As evidence, Intel is introducing the new AVX2 instruction set. AVX2 essentially doubles the performance per cycle over AVX in the original Sandy Bridge CPU. AVX2 won't just benefit supercomputer workloads; theoretically, it will also greatly increase video encoding and gaming performance, as well.

INTEL TSX

The biggest brain-bender of a feature in Haswell may be the new transactional synchronization extensions, or TSX. TSX is designed to make it far easier to write multithreaded code.

One example of where TSX is handy is in changing values in a table. Imagine that you and your co-workers are simultaneously editing, say, a spreadsheet. It doesn't take too long to figure out what happens when Ed needs to change how many transmissions are in stock at the same time that Harold and John decide to do it, too.

To prevent utter chaos, there are two routes the programmer can take: The easiest is to lock the entire table (or using our example, the entire spreadsheet) so that only one thread, or worker, can edit it at a time. This is called a coarse-grain lock. The problem here is that now Harold, John, Wai, and the other four workers sit idle while waiting for Ed to update his information in the spreadsheet. To extract more performance, a programmer can slice and dice the entire table into



Intel has been showing off Haswell silicon since 2011.

smaller sections so each can be locked when accessed. This is called a fine-grain lock and it's akin to breaking the spreadsheet into a dozen pieces so more people can edit it at the same time. But a fine-grain lock entails a lot more code for the programmer to write and balance.

What TSX does is add logic, so the processor itself can sense when the same table is being written to by different threads. So if two workers try to write to the same part of the spreadsheet, TSX acts as the traffic cop and either tells one of the workers to chill for a second or sends both to the break room. The programmer only needs to set the rules for how TSX will bounce the workers.

From an efficiency point of view, TSX promises the performance of

slicing and dicing that table into little pieces but with the programming simplicity of locking the entire table.

A NEW SOCKET

Every spring, Intel performs the same ritual. It clears the cobwebs off of its test benches, donates the old, ill-fitting lab coats to some disadvantaged company still using a 32nm process, and, well, drop-kicks the mainstream consumer-motherboard socket into the dustbin. Well, guess what? It's that time of year again, and LGA1155 is going to join the likes of LGA1156 and LGA1366 in a rat-infested landfill.

As usual, the change isn't being made just to piss you off (at least, we think), but rather to accommodate additional functionality being moved into the processor. LGA1155 is dead, but at least Intel isn't killing the cooler offsets. Like the move from LGA1156 to LGA1155, it looks like LGA1150 will be able to use the same heatsinks as its predecessor.

Beyond core improvements, Intel is promising huge gains in power conservation, too. How huge? About a 40 percent decrease in power consumption while offering more performance. Intel says it will have mobile versions of Haswell that will cut power consumption down to 10 watts versus the 17 watts consumed by a comparable Ivy Bridge such as the 3GHz Core i7-3517U.

Overall, Haswell is indeed shaping up to be an epic new processor, but one thing no one knows is when it will arrive. Intel's only comment at this point is, "sometime next year."

RED MEAT FOR ENTHUSIASTS

The other big development from Intel will be Ivy Bridge-E. If you bought an LGA2011 board because that's the socket for "real enthusiasts," you've probably been feeling a little forlorn as of late. After all, LGA2011 is still rolling a CPU with Intel's older 32nm Sandy Bridge cores. Sure, you get six of them, and a boat load of PCIe lanes that LGA1155 can only dream of, but where's the love, Intel?

That love should come, umm, sometime next year—the latest word is Q3 2013. Ivy Bridge-E is what you'd expect: six (or maybe eight) cores of 22nm Ivy Bridge action. It was originally predicted for late-2012, so why the delay? Our guess is it's because Intel just doesn't have any competition at the high end. Even the older Sandy Bridge-E will mop the floor with AMD's eight-core chips, so why push it?

The good news is that IVB-E should slot right into your LGA2011 board without issue. After that, however, LGA2011 will probably be shuffled off to make room for a new chip and socket.

OUT OF ORDER

ADVANCES IN PARALLELISM

Intel's long march to improve parallelism didn't happen overnight, but you can see how far we've come since the company's original implementation of out-of-order execution in 1995's Pentium Pro. Out-of-order execution is a computing concept that lets the CPU process instructions as the data becomes available, rather than in order. Keep in mind, this isn't about multicore or multithreading, but how the CPU handles a single thread.

Almost every performance-oriented CPU today uses out-of-order processing, with the few remaining chips that eschew it being power-saving designs such as Atom processors. Even modern ARM designs have moved to out-of-order processing to improve performance.

One key metric of out-of-order performance is the size of the out-of-order window. As you can see, we've come a long way since the Pentium Pro's window of 40 re-order buffers and Haswell's 192. If you're wondering why the Pentium 4's window of 126 re-order buffers seems out of place, that's because the P4/NetBurst was a very different CPU design that was made to have high hypersonic clock speeds at the price of efficiency-per-clock.

OUT-OF-ORDER RE-ORDER BUFFERS COMPARED

Pentium Pro	40
Tualatin (Pentium III)	64
Willamette (Pentium 4)	126
Merom/Conroe (Core 2)	96
Nehalem (Core i7)	128
Sandy Bridge (Core i7)	168
Haswell (Core i7)	192

THE COMING OF VISHERA

CAN AMD MAKE MAGIC?

ON PAPER, AMD'S BULLDOZER microarchitecture always sounded like a mean, green machine. When it landed last year, though, in the form of the Zambezi processor (aka FX-8150), it actually went about as fast as a real-life bulldozer.

AMD didn't just give up and curl into a ball, though. The company went back to work polishing the FX chip into the new AMD FX-8350 "Vishera." The chip might look like a Zambezi, but it features an improved branch predictor, improved scheduler, a larger L1 translate lookaside buffer, new FMA3 and F16C instructions, L2 improvements, and many other changes.

The best feature of Vishera, though, is its backward compatibility.

VISHERA AT A GLANCE

Model Number	**FX-8350**	**FX-8150**
CPU Name / Core Name	Vishera / Piledriver	Zambezi / Bulldozer
Base Clock / Turbo Clock / Max Turbo Clock	4GHz / 4.2GHz / NA	3.6GHz / 3.9GHz / 4.2GHz
Process	32nm	32nm
Transistors	1.2 billion	1.2 billion
Die Size	315mm^2	315mm^2
L2/L3 Cache	1MB/8MB	1MB/8MB
TDP	125 watt	125 watt
Price (at launch)	$200 (same)	$183 ($245)

AMD's Vishera looks like the original Zambezi but features higher clocks and tweaked Piledriver cores.

Vishera should work with most, if not all, AM3+ boards with a BIOS update, and AMD is promising that future CPUs will work with AM3+, as well.

ENTER THE TEST BED

To see how Vishera stacks up, we used the same Asus Crosshair V board that we used to test Bulldozer more than a year ago and outfitted it with a GeForce GTX 580, 8GB of dual-channel DDR3/1600, an OCZ Vertex 3 SSD, and Windows 8. Why Windows 8? One issue that cropped up with the original Bulldozer chip was that Windows 7's scheduler didn't know how to deal with the Bulldozer's shared multicores.

For comparison, we dusted off our old FX-8150 and set up a near-identical Intel system using Intel's Core i5-3570K on an Asus P8Z77-V Premium motherboard with Windows 8. Why the 3570K? It's the chip AMD uses as a benchmark for the FX-8350 and, frankly, our recommendation for the sweet spot of computing today.

The result? First, FX-8150 is still slow. It could barely compete with the Core i5-2500K last year and took it on the chin from the Ivy Bridge–based Core i5-3570K in just about every test we ran. In fact, it was so slow in our Premiere Pro CS6 encode that we had to rerun the tests on both the Intel and FX-8150 because we couldn't believe the results.

The FX-8350 fares far better. In fact, we'd dare say the FX-8350 is very competitive with the 3570K in some heavily multithreaded tasks. Take, for example, our Premiere Pro CS6 benchmark. The FX-8350 doesn't trounce the 3570K, but it cuts the encode time in half over the FX-8150 part. In other tests, Vishera aces the Ivy Bridge part.

You can't deny the power of the individual Ivy Bridge cores, though. We ran Cinebench 10 on a single core and the Ivy Bridge slaughtered both FX CPUs. In several of the gaming benchmarks, Intel's more efficient cores also put Ivy Bridge on top, although we did see the FX parts unexpectedly pull ahead in 3DMark, whereas usually there is no difference among CPUs in this test when the same GPU is used. Odd.

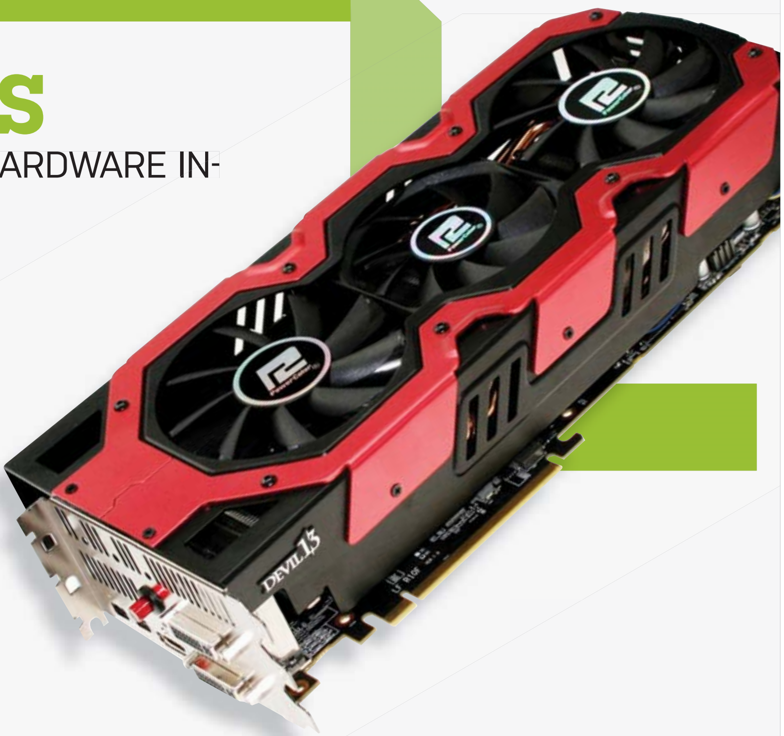
What do we recommend? If your chores are mostly limited to gaming and tasks that can't exploit all eight cores, the Intel part has the advantage. If, however, you are rendering 3D or transcoding or rendering video (except in Adobe's Premiere Pro CS6), the new FX-8350 should be your pick. It offers a longer socket roadmap and gives you better performance in these areas. We do have to add, however, that the performance gap probably isn't as good as AMD fans would expect, considering the clock and core-count difference between the FX-8350 and Core i5-3570K. Still, for AMD these days, a tie is probably good news considering it's up against Intel's best cores to date.

BENCHMARKS

	FX-8350	FX-8150	Core i5-3570K
Price	$200	$183	$225
Cinebench 10 Single Core	4,483	4,200	**6,866**
Cinebench 11.5	**6.90**	5.87	6.41
Premiere Pro CS6 (sec)	5,220	9,301	**3,422**
Handbrake Blu-ray encode (sec)	**8,400**	9,791	9,539
X264 HD 5.01 Pass 1 (fps)	**61.3**	53.6	57.1
X264 HD 5.01 Pass 2 (fps)	**15**	13	12.7
Stitch.Efx 2.0 (sec)	1,511	1,846	**971**
ProShow Producer 5 (sec)	1,695	1,832	**1,463**
7Zip 9.20 Benchmark	**23,728**	20,325	17,504
Fritz Chess Benchmark	**12,506**	11,715	11,468
SiSoft Sandra (GB/s)	18.9	19.2	**21.3**
PC Mark 7 Overall	4,408	4,100	**5,582**
STALKER: COP (fps)	132.1	132.1	**167.3**
3DMark 11 Overall	**P6,437**	P6,259	P6,043
3DMark 11 Graphics	**6,361**	**6,370**	5,802
3DMark 11 Physics	7,005	6,234	**7,263**
3DMark 11 Combined	**6,444**	5,569	6,426
Valve Particle (fps)	119	107	**155**
Heaven 3.0 (fps)	134.4	130.0	**138.3**

Best scores are bolded

AMD threw the white flag in 2012 by never releasing a dual-GPU flagship board, but that didn't stop PowerColor from developing its own HD 7990.



NEXT-GEN GPUS

EXPECT VERSION 2.0 OF THE SAME HARDWARE INSTEAD OF BRAND-NEW DESIGNS

NVIDIA TO UNLEASH KEPLER 2.0

2012 was a great year for Nvidia's Kepler architecture and we'll see second-generation Kepler cards in 2013, though specifics are unknown. Nvidia, not surprisingly, isn't talking. We do know one thing: The GTX 680 is not the full-powered implementation of Kepler technology, as it features a graphics chip dubbed GK104, which in Nvidia-speak means something akin to "midrange part." If you recall, the GTX 560 Fermi board from 2011 featured a chip named GF104, and it wasn't until the GTX 580 was released that we saw a GF110 chip. So when the GTX 680 launched this year with GK104, we naturally had to ask, "Where's the GK110?" Nvidia answered that question when it pulled the wraps off its Kepler GK110 chip in May at the GPU Technology conference, revealing a massive GPU that has almost double everything compared to the GK104 chip found in the GTX 680. Designed for the Tesla K20 that will be used in the world of GPU computing, GK110 boasts twice as many transistors as the GTX 680, sporting 7.1 billion compared to the GK104's 3.5 billion; it also has 2,880 CUDA cores within 15 SMX units compared to the GTX 680's 1,536 CUDA cores in eight SMX units. Its six memory controllers give it a 384-bit memory bus compared to the GK104's 256-bit interface. To be clear: The next-gen GTX 780 will not feature a full-strength GK110—it would be totally uncharacteristic of Nvidia to double performance in the next generation, particularly when the competition doesn't warrant it—but there's lots of headroom there to offer healthy gains in performance, nonetheless.

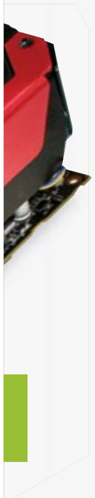
With the GTX 680 already holding the title as fastest single-GPU card for gaming right now, it's possible Nvidia will hold off on overclocking any of its 6-series cards and just move onto its second-generation 7-series Kepler boards. It's an approach similar to Intel's tick-tock strategy—release new architecture, then refine it for the second generation. If you were waiting for all-new hardware from Nvidia in 2013, don't hold your breath. The current plans are to run with Kepler for 2013 until Nvidia's next-generation 20nm hardware, dubbed Maxwell, appears in 2014.

Nvidia's monstrous GK110 chip is already in use in the Tesla K20 board, and has twice as many CUDA cores and transistors as a GTX 680.

AMD GOES ISLAND HOPPING

AMD had an interesting 2012. It released its all-new Radeon HD 7970 "Tahiti" board and rightfully claimed the throne of best-performing single-GPU card, only to have its crown stolen two months later by the slightly more powerful yet significantly less power-hungry Kepler-based GTX 680. AMD must have been pissed, and we'd understand why. It reminds us of the time *Extreme Maximum PC* magazine launched right after us. Regardless, just like Nvidia, AMD will be refining its existing technology for 2013—the code-name of the next gen is Sea Islands (the previous version was Southern Islands). It will be based on a hopped-up version of the existing 28nm architecture named Graphics Card Next that was first used in the Radeon HD 7970. Don't be disappointed, though, as we expect substantial improvements from AMD in 2013, especially since the company has seen what it's up against. To wit, according to leaked roadmaps, the next-gen flagship HD 8970, code-named Tenerife after an island off the coast of Morocco, will reportedly pack a whopping 5.1 billion transistors (a GTX 680 has 3.5 billion and an HD 7970 has 4.3 billion), around 2,300 stream processors, 3GB of memory, and a 384-bit memory bus. A dual-GPU version of this card, dubbed HD 8990, is expected to appear, as well, but since the dual-GPU HD 7990 never officially launched, it's possible this 10-billion transistor monster will never see the light of day. (It should be noted that a dual-Tahiti HD 7990 does exist, though it's as rare as a brown unicorn and costs $1,000. It's a one-off effort by PowerColor, and not an officially sanctioned board from AMD, with 6GB of RAM, three fans, and a TDP over 500W.)

Even more interesting is the rumored HD 8870, which will offer HD 7970 levels of performance at a significantly lower TDP of just 160W (TDP of the HD 7970 is 250W). When we spoke to the company about its plans, all it would say was that it thinks power-per-watt is an increasingly important feature, that it loves dual-GPU designs, and that in the near future, we might see a GPU being used for motion-tracking duties similar to those found on the Xbox Kinect and Wii consoles.



STORAGE

NEW PORTABLE FORM FACTOR, NEW DESKTOP I/O

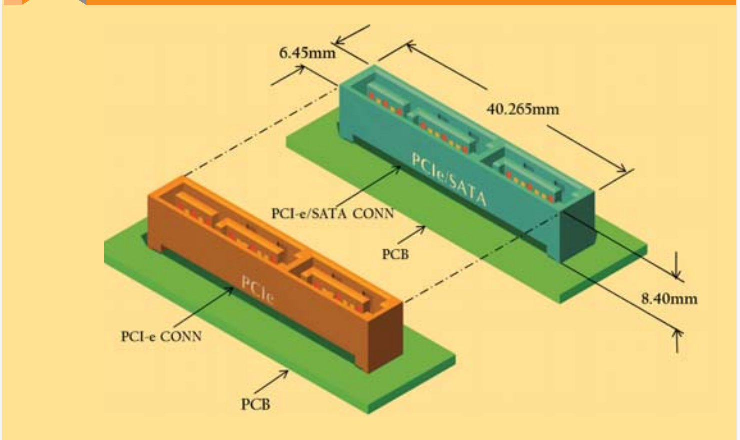
BAD NEWS, desktop-SSD jockeys: In 2013, our 2.5-inch SSDs will remain largely unchanged, and most of the innovation will unfortunately take place in the portable mSATA format because OEMs need a way to stuff SSDs into Ultrabooks. In case you missed the memo, with the launch of Windows 8, Ultrabooks and tablets are all the rage these days, but mSATA has too many restrictions so it's getting tossed in favor of a new standard for next-generation drives cleverly named NGFF, which stands for Next Generation Form Factor. This new design and interface will allow manufacturers to create tiny SSDs in a variety of sizes and capacities instead of being forced to use the current one-size-fits-all design of mSATA.

On the desktop, we already have drives saturating the SATA 6Gb/s bus and plans are afoot to rectify this with a new standard that combines the bandwidth of PCI Express with the ubiquity of SATA, named—you guessed it—SATA Express. The new bus will accommodate SATA 6Gb/s devices *and* PCIe drives at the same time, which is unlike the transition we experienced from parallel ATA to SATA, where we saw two independent connectors on a motherboard and drive simultaneously.

The rapid performance increases of SSDs over the past years has rendered the SATA interface insufficient. Mechanical hard drives are just fine with SATA, but the pace of SSD development is moving too fast for SATA to keep up, so it has to go. Out of the gate, SATA Express will use two PCIe 2.0 lanes, allowing up to 1Gb/s transfer speeds. As more lanes are added to the bus, we'll eventually see bandwidth increasing all the way up to 16Gb/s. Sadly, we don't anticipate this transition to happen quickly, as we've been hearing about SATA Express for more than a year now and we've yet to see so much as a picture of a working prototype. Our best guess is that we'll see it emerge in 2014, with 2013 being a year where manufacturers begin to highlight features other than speed in the current technology, since most of the drives will be able to saturate the bus at 600MB/s. Features such as power consumption, reliability, and encryption will be the talking points until the arrival of SATA Express, when manufacturers will then go back to touting sequential read speeds and max IOPS.

Where rotating drives are concerned, it'll be all quiet on the Western front for the most part. Nobody is talking about where these drives are headed, and nobody really seems to care, as we're not interested in their performance as much as their capacities now that we have SSD boot drives. And since there are only two hard drive manufacturers now—WD and Seagate—there's not much competition between them from a consumer's point of view. From our perspective, hard drive coverage will be rare, but you'll see us review 5TB drives when they appear sometime next year.

The SATA Express connector (right) will offer backward compatibility with SATA drives until we fully transition to a PCIe connector (left) for storage duties.



DESKTOP MONITORS

PIXELS GALORE

Let's face it, high-resolution panels have been stuck in the mud for years. It's been, what, five years since the 30-inch, 2560x1600 panels hit our desktops and nothing has advanced. The only real change in monitor-land has been a *decrease* in resolution to 2560x1440 with 27-inch panels and excitement over buying reject 27- and 30-inch screens from Korea. That's all expected to change next year—at least, for people with deep pockets. In 2013, expect to see 4K panels with resolutions of 4096x2160 hit the streets. A monitor such as Eizo's 36.4-inch DuraVision FDH3601 (below) is the equivalent of ganging four 1080p 23-inch panels together—for but $35,000. Eizo won't be the only 4K panel maker, though. ViewSonic has been showing off its VP3280, which boasts 3840x2160 on a 32-inch panel. Resolutions are expected to continue to climb, too, with Intel forecasting that desktop monitors will hit 4800x2700 by 2015. By then, the company thinks, a 2560x1600 17–21-inch monitor will be mainstream.

Hybrid, or convertible, devices like Lenovo's IdeaPad Yoga, will give consumers the best of both worlds: notebook and tablet.

PORTABLE PCS

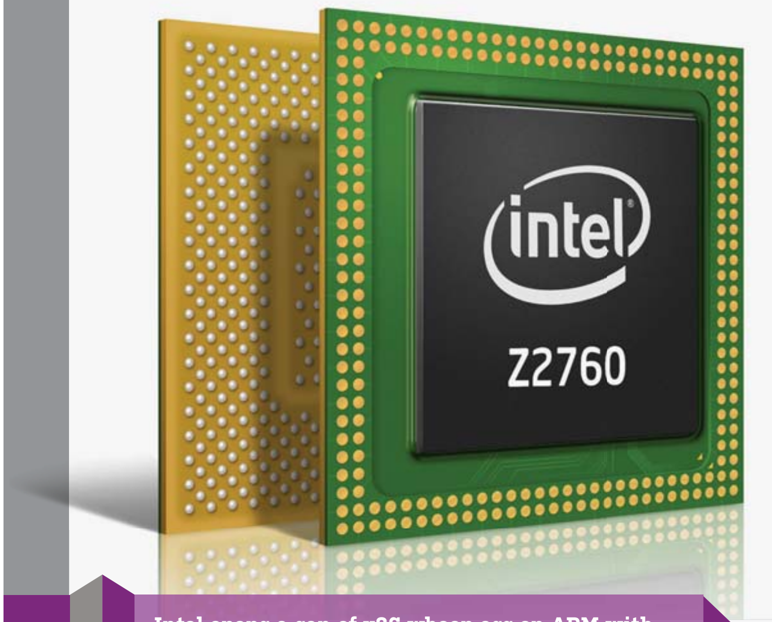
ULTRABOOKS, HYBRIDS, AND TABLETS, OH MY

LEST YOU WORRY that 2013 will be a quiet year for PCs, consider the knock-down, drag-out dust-up that's about to go down between x86 and ARM. Intel's dream of dominating the mobile space as thoroughly as it's dominated traditional PCs rests on the success of a new wave of devices—not to mention Windows 8.

For starters, Ultrabooks will undergo a serious evolution, with key changes under the hood as well as in design that Intel says will realize the categories' true potential—the true potential being Ultrabooks' ability to compete in a serious way with tablets. Next year's Ultrabooks will virtually all sport touchscreens, the natural complement to Microsoft's new touch-optimized OS. Consumers will be able to tap, scroll, and pinch their way around the Metro UI, then transition to keyboard and mouse in Windows' old-school desktop environment.

Battery life will be greatly improved, thanks to key power-management features in Intel's upcoming Haswell chip. It's reported to dramatically lower idle power, while a new power state, called S0ix, assumes a somewhat-active state that consumes minimal power but transitions to active state more rapidly than Hibernate.

Expect to see Smart Connect Technology touted for its ability to automatically update applications such as email and social networks even when your computer is asleep, and Intel Wireless Display for sharing content from your portable device with your HDTV, as well as anti-theft and identity-protection features. All of the above is meant to help Ultrabooks achieve the "must-have" status enjoyed by Apple's phenomenally successful iPad.



Intel opens a can of x86 whoop ass on ARM with its low-power Clover Trail chip, capable of running Windows 8 on tablets.

A new subset of Ultrabooks that you'll see of lot of next year is the hybrid, or convertible, form factor. So while conventional Ultrabooks are slated to become even thinner and lighter—thanks to the improved power efficiency of Haswell along with newer, more lightweight materials—it's the dual-purpose notebook/tablets that will likely really turn heads. Unlike the traditional clamshell body, the hybrid devices either contort into a tablet when the screen is folded all the way back—à la Lenovo's IdeaPad Yoga—or feature a screen, behind which all the brains of the computer are housed, that detaches from the keyboard for more tablet-y usage—think Asus's Transformer Prime. Even within these two body types, consumers will see a lot of differing implementations and degrees of success as vendors try out new designs to see what sticks.

While the hybrid solution gets closer to meeting tablet ideals—while offering a hell of a lot more power and flexibility in the process, we might add—the x86 take-over of the mobile space might have its best chance in straight-up Atom-based tablets. Yes, Atom is back. But it's not the underpowered lemon of a CPU that fueled the netbook craze. The new Atom Z2760, aka Clover Trail, is a full-fledged system-on-chip featuring a 1.8GHz dual-core CPU with Hyper-Threading and PowerVR SGX 545 graphics. We recently spent hands-on time with a Clover Trail–based Acer Iconia W510 tablet running Windows 8 Pro and were surprised and delighted at how much smoother and faster it was over the Atom netbook experience.

Of course, low power consumption is a key in Clover Trail, and Intel says devices using the chip will run for 10 hours on a charge and last up to three weeks on standby. Pricing for Clover Trail tablets also seems promising. Acer has already announced that its 10-inch W510 tablet will start at $500. That's the same price Microsoft is asking for its 10-inch ARM-based Surface RT. And that tablet is limited to the Metro UI and apps sold through the Windows 8 store.

MOTHERBOARDS

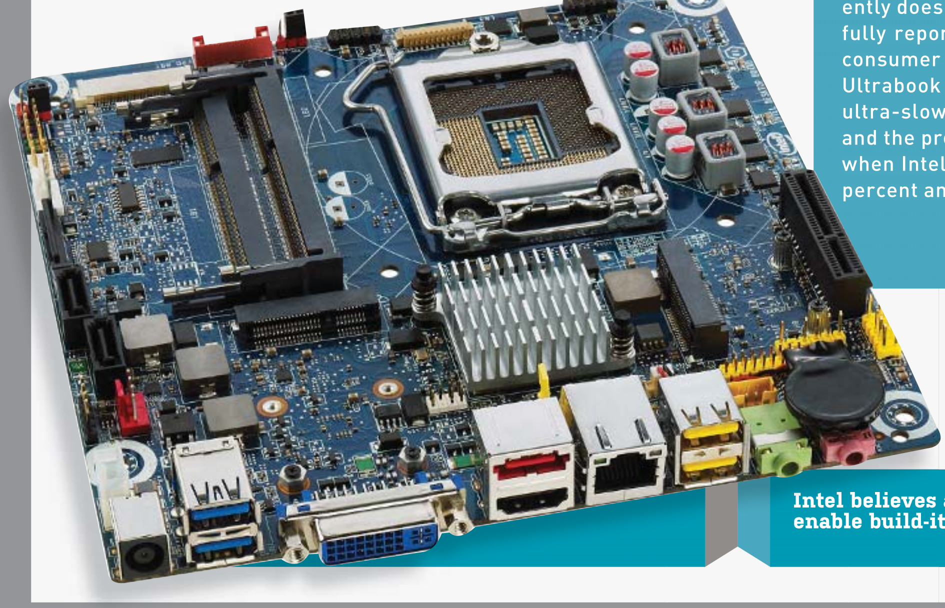
THIN WILL BE IN

NEXT YEAR, motherboards should continue to offer the same performance and mainstream partitions that we've seen from both Intel and AMD. Intel will continue to support its LGA2011 socket for enthusiasts through at least 2014, and AMD will do the same for AM3+. The mainstream, however, will see some changes. Intel will move away from the existing LGA1155 socket in favor of a new LGA1150 socket that is—wait for it—incompatible with existing CPUs. LGA1150 will be coupled with Haswell and is rumored to come with support for up to six USB 3.0 ports (up from four) and six SATA 6Gb/s ports (freaking-finally!). The Z87 chipset, among others, may also finally ditch support for PCI.

In AMD-land, the socket situation is fairly stable. The company has committed to supporting the long-legged AM3+ socket through the new FX-8350 Vishera, as well as through its replacement, code-named Steamroller. In the mainstream arena, AMD threw FM1 users a change-up by using the new FM2 socket for its new Trinity chips. The good news for those with FM1 boards is that new FM2 CPUs, such as the A10-5800K, are backward compatible with the older FM1 boards. However, you can't install an FM1 CPU in a new FM2 board.

While microATX and ATX will remain mostly the same, we should see far more movement in the Thin Mini-ITX standard that Intel has been pushing for the last 12 months. Thin Mini-ITX is a motherboard form factor built on the existing Mini-ITX spec. Thin Mini-ITX is spec'd to support up to a 65-watt processor and significantly shrinks the I/O shield from the standard 44mm size used in Mini-ITX and ATX to 25mm. The rest of the board is also limited to a thin 25mm height through the use of SO-DIMMS laid flat instead of vertical on the motherboard, low-profile thermal solutions, and a long-overdue fixed CPU location. A fixed CPU location lets chassis builders themselves implement a customized cooling-solution design specifically for their chassis. Mini-ITX also specs internal digital-video connections such as LVDS and eDP.

Thin Mini-ITX is intended mostly to accommodate a DIY all-in-one market that Intel is hoping will sprout next year, but it will also aid the building of smaller small form factor boxes, too.



Intel believes a slimmer Mini-ITX design will enable build-it-yourself all-in-ones.

COLOR US MISTAKEN

OUR MEA CULPA

There's a reason no one ever gets mad at the weatherman for a bad forecast: No one can actually predict the weather, and by Wednesday, no one cares what the weather was on Tuesday, anyway. But we hold ourselves accountable in making our tech predictions, so we're perfectly willing to admit where we've been wrong.

BTX

Despite our predictions, it never appeared. Developed as an alternative to ATX, BTX was Intel's attempt to update the design of the PC, which was still using the same specifications laid out in 1995. BTX moved the south bridge closer to the rear of the computer for easier trace routes for such things as USB 3.0, and the CPU was moved to the front of the case where it could be kept cooler. BTX was ultimately a failure, though. Industry resistance and Intel's own left turn away from the nuclear-warm Prescott Pentium 4s in favor of super-cool Core 2 CPUs rendered BTX a bust.

SATA 12GB/S

Back in the day of mechanical drives, it all seemed so easy: SATA 150 to SATA 300 to SATA 600. It just made sense that SATA 1200 would come along, too, just as we predicted. Wrong. The incredible speed of SSDs ensures that SATA 1200 will be thrown overboard in favor of SATA Express.

ULTRABOOKS

We love, just love, ultra-light, ultra-powerful, and ultra-thin notebooks, but the public apparently doesn't. In our 2012 Tech Preview, we cheerfully reported Intel's belief that 40 percent of all consumer notebooks sold in 2012 would be of the Ultrabook variety. Instead, Ultrabooks have been ultra-slow to move, thanks to a dismal economy and the proliferation of tablets. Color us skeptical when Intel predicts that Ultrabooks will grow 300 percent and sell 95 million a year by 2016.

THE SHAPE OF THINGS TO COME

THE PC ISN'T GOING ANYWHERE, BUT WILL EVOLVE AND ADAPT THE WAY IT ALWAYS HAS

THE PC, BY DESIGN, is an incredibly difficult technology to attack. Its commodity components and its open architecture—think of it as the opposite of the walled-prison environment—give it the ability to pivot and mutate to meet new challenges and needs.

To wit, in the 1990s, the Network Computer idea was floated as a way to push the PC off of corporate desktops. PCs, as we were told, had become too expensive to buy for every drone, and too expensive to support. The NC would leverage the power of the network by running "diskless" with a very thin OS such as Java or the NCOS.

Instead of adopting the NC computer, though, corporations ended up buying ments from competing firms ridiculed a PC workstation as the free toy in a cereal box compared to their specially designed, purpose-built servers and workstations with RISC processors. Today, you'd be lucky to find a non-PC-based workstation, and supercomputers, as well, have largely been dominated by PC technology—via either x86 or PC graphics.

Not all of the threats have been so easy to fight off, though. Game consoles and their fixed (and now ancient) hardware specs have captured the casual mainstream gamers' hearts and minds in the living room, relegating PCs to a niche subset of gaming. But that could change.

us actually use said power, but the PC has simultaneously evolved to meet smaller challenges.

Could the runaway popularity of the tiny SoC-based Raspberry Pi become a threat? No way, as the PC is now right there, too. Intel's new "Next Unit of Computing" is essentially a way for OEMs and hobbyists to build wee PCs. With a Core i3 at its heart, and either dual HDMI ports or an HDMI and a Thunderbolt connector, the NUC is a complete Core i3 box in a 4x4-inch square. A complete kit with HD4000 graphics, a 40GB mSATA, and 4GB of RAM is expected to sell for under $400. That's certainly not price-competitive with the $35 bare-bones Raspberry Pi, but it's

Every PC today can trace its lineage back to the IBM PC 5150.

PCs like the Alienware X51 may very well put PC gaming into the living room.

Intel's tiny NUC offers full-on desktop power and capability.

more PCs. Just because the PC was a fat client didn't mean it couldn't alternately run as a near-dumb terminal. Such is the beauty of the PC's versatility. And despite the NC's incredibly low performance needs (which should have lowered prices), the PC's commodity components made them cheaper still to run and service.

Likewise, the market for supercomputers and workstations was not the purview of the PC in the 1990s. Advertise-

Meet Valve's Big Picture Mode. Just take an Alienware X51 or Falcon Northwest Tiki, add an Xbox controller, and you're playing on a machine that will have any game console curled up in graphical shame (to learn more about Big Picture Mode, see our How To on page 62 and our Build It on page 66).

The PC's rectangular form factor, too, has mutated to meet a changing world. Yes, the towers of power will always be with us because some of

far more powerful. AMD partners have also been playing in this area, with E-350 and E-450-based boxes such as Zotac's Zbox series.

We don't even have the space to get into the phenomenal changes PC notebooks have gone through in the last two years and continue to go through. The fact of the matter is that the PC has evolved to meet every challenge put before it thus far and, in the end, has won.

SMS

SOFTWARE WORTH PAYING FOR

IT HURTS US TO SAY IT, BUT FREEWARE CAN'T COVER EVERY SITUATION. WE'VE ROUNDED UP A SELECTION OF SOFTWARE AND WEB SERVICES THAT DESERVE YOUR DOLLARS BY DAVID MURPHY

We're huge fans of freeware at *Maximum PC*. Why pay for expensive software when a perfectly reasonable and fully functioning piece of freeware exists as a compelling alternative?

But sometimes this holy grail of applications doesn't actually exist, or the freeware alternative lacks mission-critical features. That's exactly what we're exploring in this roundup. We've culled a variety of software and web services, covering all kinds of topics at all sorts of price points; if the task at hand is important to you, we think you're best served by forking over some hard-earned cash.

It's important to note that a number of the apps on our list have evaluation versions. There's no shame in checking them out as part of your decision-making process before swiping your card—that's why demos exist, after all. Same goes for our list of web services. If they're a bit too pricey or too overboard for your needs, feel free to consider the more limited free versions instead! We don't mind. Our sole goal is to turn you on to some worthwhile software and services that just happen to cost some dough.

RECORD YOUR DESKTOP

FRAPS

Tired of watching everyone else's tutorials, game recordings, and hilarious outtakes on YouTube? If you want to capture

your own PC gaming videos, annoyance-free, Fraps is the way to go. Your small contribution will remove the watermarks present in the app's free version and, more importantly, allow you to record videos as long—or as large—as you want. Capturing screenshots and recording your frames-per-second across your gaming binges is just as easy.

$37, www.fraps.com

CAMTASIA STUDIO

Camtasia Studio isn't the best choice if you're looking to make videos of your gaming adventures, but it makes up for that by offering a compelling recording, editing, and publishing experience for just about

everything else. This is the app you'll want to have if you're interested in making high-quality movies of your normal Windows experience—for, say, tutorials on how to use a particular app from this roundup!

$300, www.techsmith.com

APPLE CLONING

OBJECTDOCK

OK, let's just admit it and be done with it: The taskbar found in OSX—you know, the "Dock" that magnifies and contracts when-

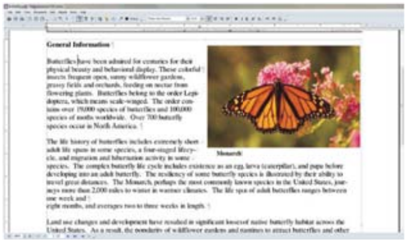
ever you move your mouse over the icons—is pretty neat. It might not be as functionally superior as the Windows Start menu, but since you won't find that *either* in Windows 8, slapping a lovely Apple-like Dock at the bottom of your screen can be a pleasing mix of function and form.

$20, www.stardock.com

PDF EDITING

FOXIT ADVANCED PDF EDITOR

In the wide world of PDF manipulation, it's rare that you'll find a program for viewing and editing PDFs that doesn't cost an arm



and a leg. Adobe's "industry-standard" app, Acrobat, will set you back a cool $300 for the full version—all that, just for the convenience of being able to edit and manipulate PDF documents you've created or downloaded. Our solution? Foxit's app, which is just as feature-filled for one-third of the price.

$100, www.foxitsoftware.com

VIDEO EDITING

LIGHTWORKS

Billed as the only video editing application that's, "designed by editors, for editors," the

expensive Lightworks program supports a whole host of video and audio formats for your clips, which you can then jam onto a super-advanced, codec-independent timeline that lets you add effects and transitions, or make adjustments to speeds and levels, in real time. Be sure to try out the free version before you plunk down your cash on this app, just in case you're not actually trying to turn your home movies into IMAX-worthy creations.

$60/year, www.lwks.com

ADOBE AFTER EFFECTS

Oof. Video manipulation ain't cheap. But Adobe's After Effects is really the end-all,

be-all of consumer visual-effects applications. We almost want to put "consumer" in quotes, because this product definitely sits outside the range of your average video amateurs who want to learn how to add a little pizazz—or lightsabers—to their backyard clips. At least Adobe offers a subscription service for folks who want to dabble with a slew of rendered effects without going bankrupt.

$1,000 retail or $20/month for one-year subscription, www.adobe.com

ADOBE PREMIERE PRO

It might seem like we're riding the Adobe

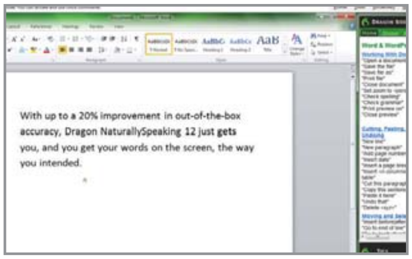
train with our video recommendations. It's for a reason. Premiere Pro remains

the (Windows-based) industry standard for an app that can handle video importing, editing, and exporting all at once. That's important to mention, because you *can* hodgepodge your way through cursory video editing using a variety of freeware tools. Once you're ready to get serious about edits, transitions, rendering—the whole nine yards—Premiere Pro will give you great stability and speed for your investment.

$800 or $20/month for one-year subscription, www.adobe.com

TALKING TO YOUR COMPUTER

DRAGON NATURALLY SPEAKING 12



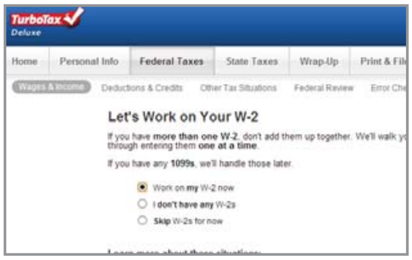
You can talk to your smartphone and, with luck, it can transcribe what you're yelling at it in the car. Unfortunately, speech recognition on your desktop or laptop computer is a bit lacking. While the feature does come bundled within Windows 7 and Windows 8, Microsoft's implementation of voice analysis—specifically, its speed and accuracy—leaves much to be desired versus the capabilities of third-party apps like Dragon Naturally Speaking 12. With a bit of voice training, you'll be dictating to your desktop in no time.

$100, www.nuance.com

TAX PREPARATION

TURBOTAX

Easy. Simple. Infrequently wrong—at least,



not as wrong as you'd probably be if you attempted to do your taxes the (more painful) long way. The simplicity of TurboTax, even when faced with crazy deductions and other assorted pains of owning a small business (or working as a freelancer), means you'll likely be able to wrap up your yearly taxes after only a single night's work. Enjoy your free Federal filing!

Deluxe (Federal and State taxes): $50 online, $70 CD/download, www.turbotax.intuit.com

WI-FI HOTSPOT

CONNECTIFY

Here's the problem: You're in a hotel with easy access to Ethernet-based Internet.

You also want to get on the web using your tablet, smartphone, or another laptop, but the hotel's wireless Internet is horrible.

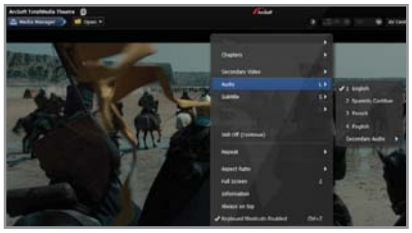
Solution? Connectify. This awesome program transforms your laptop or Wi-Fi-equipped desktop into an access point. Assuming that your networking bits and pieces all play nicely—it's worth checking out Connectify's trial version just to make sure—you'll be able to unleash your own password-protected Wi-Fi hotspot for anyone to use. The app even lets you share the connection from 3G and 4G LTE USB dongles!

$45 (lifetime license), www.connectify.me

BLU-RAY PLAYBACK

ARCSOFT TOTALMEDIA THEATRE 5

Because it costs so darn much for Microsoft to license the right codecs, there's absolutely no way that the ability to play Blu-ray discs is ever going to find a home in Windows Media Player on a standard version of the Windows operating system. While you can play unprotected Blu-rays



with the freeware app VLC, you still have to cough up cash for an awesome third-party app like ArcSoft TotalMedia Theatre 5 if you want to (legally) watch *The Avengers* on your system.

$100, www.arcsoft.com

MULTI-MONITOR HAPPINESS

DISPLAYFUSION

If you're one of those stalwarts who plans to wait out Windows 8, then you're going to want—nay, need—an app that offers better

support for multi-monitor setups than the pitiful options found in Windows 7 or Windows Vista.

DisplayFusion gives you increased control over your multi-monitor setup, including the ability to set up taskbars that span your screens as well as separate wallpapers and screensavers for each monitor. We love it so much that we believe this app should come packaged with every new monitor purchase.

$35, www.displayfusion.com

MOUSE LAZINESS

REMOUSE

And here you thought macros for Microsoft

Excel were cool. ReMouse allows you to make a recording of your mouse and keystrokes over a given time period. You can then save that recording to a file, load it up at a later date, and play back your actions once, loop them a set number of times, or loop them forevermore.

Purchasing the app's standard edition unlocks Smart Recording, which will ensure that your recorded movements always match loaded apps based on the relative position of the Window when it appears.

$39, www.remouse.com

DESKTOP ORGANIZATION

FENCES

It has to be said: The organizational elements of Windows 8's Metro UI stink.

Especially compared to what you can do with this awesome third-party app for both the "normal" desktop of "old Windows" and Windows 8's desktop mode. Fences drops scrollable, highlighted areas onto your desktop where you can dump shortcuts and files for better personal organization—and it can even automatically assign new icons to Fences you've already created.

$10, www.stardock.com

DIVVY

Resizing windows can be a pain—not the

act of doing it, mind you, but the continual repetition that comes from having to tell Windows to resize and move the window of your favorite app to the exact place you like having it on your desktop.

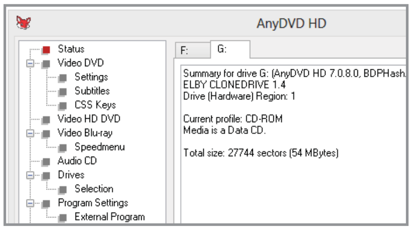
Divvy automates the entire process by giving you a grid to quickly resize your windows on, in addition to a bunch of hotkey shortcuts that can automatically slap your window to your desired location.

$14, www.mizage.com

DVD/BLU-RAY UNLOCKING

ANYDVD ANYDVD HD

We've extolled the wonders of AnyDVD for some time now. But in case you've been living under a rock, or have never heard about this delicious means for removing



FIVE MOST PIRATED APPS

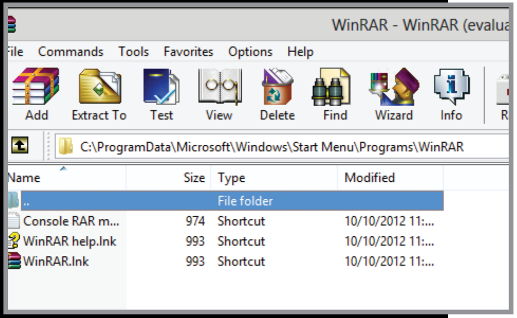
People should be paying for them, but aren't

Thanks to the helpful tracking capabilities of The Pirate Bay—a site that's ascended from the shadowy underground of illegal software, music, and movie downloads and entered the public vernacular—it's easy to figure out which apps find a home on the Internet's "most-pirated" list. Of course, we're only looking at individual BitTorrent links, not a combined count of just how many iterations of "Windows 8" are littered across the site.

Go figure, many of the links compromising TPB's most-downloaded list are Adobe products. If you've been following our roundup at all, it's easy to see why: They offer compelling functionality that's difficult to find as a total package elsewhere, but they're extremely expensive for your average person to pick up.

WinRAR—to fulfill the ongoing Reddit joke that nobody, ever, ever pays for a copy of this app—also graces the top of The Pirates Bay's charts, a curious inclusion given that rival program 7zip offers similar functionality and speeds for a cost of absolutely nothing.

Avast Antivirus is another such oddity, since one can also pick up free, real-time antiviral scanning through Microsoft Security Essentials. And MSE—which is built right into Windows 8 as part of Windows Defender—is a great complement for Windows XP, the most popular operating system to grace The Pirate Bay's top-downloads list.



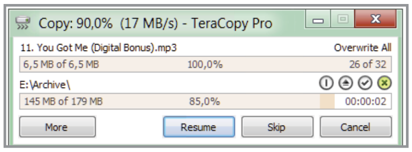
Why pirate WinRAR? Do people really hate the nag screen that occasionally appears over the window—but doesn't interrupt or prevent a common file-extraction request—that much?

the region codes (and other annoyances) on DVDs, HD-DVDs, and Blu-rays, here goes: AnyDVD does all that and more, including a one-button ripping function that can package an optical disc into a physical file on your drive (ISO) or dump it out to its raw file structure.

$89 for lifetime AnyDVD license; $154 for lifetime AnyDVD HD license, www.slysoft.com

FILE COPYING
TERACOPY

Windows 8 does much to improve on the raw file-copying/moving capabilities of previous

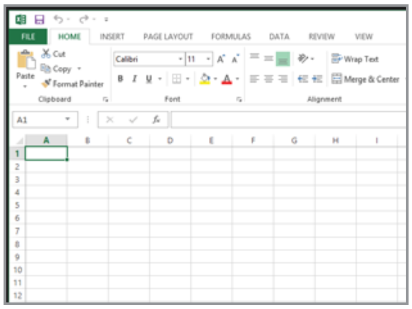


versions of Windows, but the enhancements found in TeraCopy still deliver a speedier overall transfer in addition to a few extra features. Like, for example, the ability to re-attempt transfers that fail due to any particular error and, if necessary, skip the files without cancelling the entire move or copy operation. If you're rocking Windows 7 (or earlier), this app is a definite must-have.

$20, www.codesector.com

SPREADSHEETIN'
MICROSOFT EXCEL

Yes, plenty of free options exist that offer alternatives to Microsoft's official



spreadsheet application. However, they're simply incomplete compared to what Excel delivers (especially if you're looking to incorporate any VBA macros into your digital tool kit), and can present a bit of a problem if you're trying to jump back and forth between, say, OpenOffice's Calc and Microsoft Excel in a work environment. Additionally, if you have any interest in integrating your spreadsheet lifestyle with the cloud, Excel's your ticket—OpenOffice remains a desktop-centric app.

$150 for full Office Home and Student suite, office.microsoft.com

TASKBAR TWEAKING
BINS

We've shown you how to better organize your desktop and even give it a Mac-like

taskbar, if you're so inclined. If you're not, the inexpensive app Bins allows you take the standard buttons found on your Windows 7 taskbar and transform them into groups, analogous to what you might find on your smartphone's "desktop." These individual icons—now a collection of shortcuts—can be ideal for compacting all your web browsers into a single, expandable link, for example.

$5, www.1upindustries.com

SONG-FIXING
TUNEUP

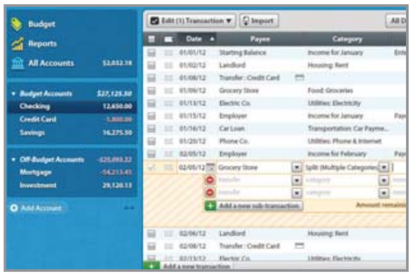
Little is more annoying than having a collection of music that's completely

mislabeled, somewhat mislabeled, or mislabeled just enough to cause havoc within the library of your song application of choice (ideally, iTunes or Windows Media Player). TuneUp, a plugin for either aforementioned app, helps you de-dupe, standardize, and fill in the missing details of your mighty musical archive. And once you've done all of that, the plugin will even give you song lyrics and upcoming concert dates.

$50 for one-time purchase; $40 for an annual subscription, www.tuneupmedia.com

FINANCIAL DISCIPLINE
YOU NEED A BUDGET

The name is almost self-explanatory. Nevertheless, this software—primarily a Windows app with both iOS and Android tie-ins—is a finance application that helps you keep track of your spending decisions, monthly allowances, and all other things money management–related. While the app doesn't tie directly into your bank account like, say, Mint, it does allow you to import your raw financials if you so desire.



A ton of built-in reporting gives you plenty of options to see how well (or poorly) you're keeping your finances in check.

$60, www.youneedabudget.com

SPYWARE ERADICATION
MALWAREBYTES' ANTI-MALWARE

You can install the free version of Malwarebytes' Anti-Malware and reap nearly all of the benefits of the paid-for app, save one. And it's a biggie: Real-time protection for your system. For what good is a malware search-and-destroy kind of an app if you

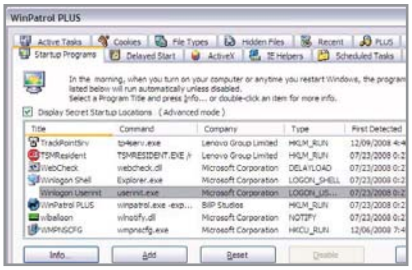
never remember to run it? Malwarebytes' Anti-Malware is a frequently updated bazooka of protection compared to the lesser (but free) Windows Defender, though it never hurts to have both in your back pocket when spyware strikes!

$25, www.malwarebytes.org

WINDOWS MONITORING

WINPATROL

WinPatrol is one of those kitchen sink–like applications that's designed to throw a grab-bag of options your way for making sure that the more intricate bits of Windows aren't messed up by other apps (or worse, malware). For example, WinPatrol will alert you when another app is trying to modify the list of apps that start when



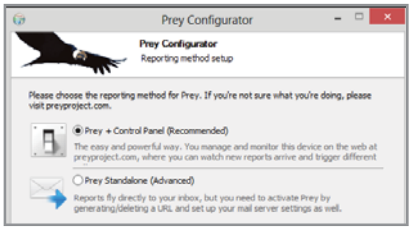
Windows loads, or if an app is actively trying to uninstall *another* program on your system. Yikes!

$30, www.winpatrol.com

HUNTING DOWN THIEVES

PREY

Laptop thieves suck. Plain and simple. While those Apple enthusiasts have their fancy little iCloud and Find my Mac and



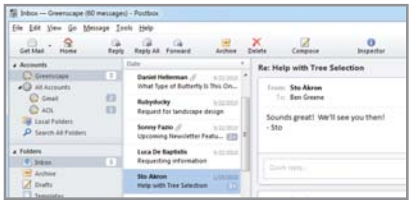
all that, Windows users are pretty much left out in the cold when it comes to recovering their purloined PCs. Unless, of course, you install a tracking app like Prey, that is, which will take pictures of your thief using your laptop's built-in webcam and attempt to notify you of your laptop's location (among other nifty features). Too bad it doesn't come with a self-destruct mode….

$5/month, www.preyproject.com

GMAIL MASTERY

POSTBOX

If you're big on Gmail—and hate Outlook—then you might want to check out the ap-



plication Postbox, which delivers a compelling Gmail experience to your desktop (sans web browser). You've got labels, priority messaging, Google Calendar integration, and even the ability to run your favorite Gmail keyboard shortcuts within the desktop app itself. Fun features like the automatic creation of shareable links to files in your Dropbox go above and beyond anything you'd find in other offline email apps.

$10, www.postbox-inc.com

WEB SERVICES WORTH PAYING FOR

Desktop apps? Pshaw. The future's in the cloud, man

PC BACKUP

CRASHPLAN

When you-know-what hits the fan on your PC, you're going to kick yourself if the last time you backed up your hard drive to an external device was two years ago. Solution: Stash it on the cloud (no storage limits!)

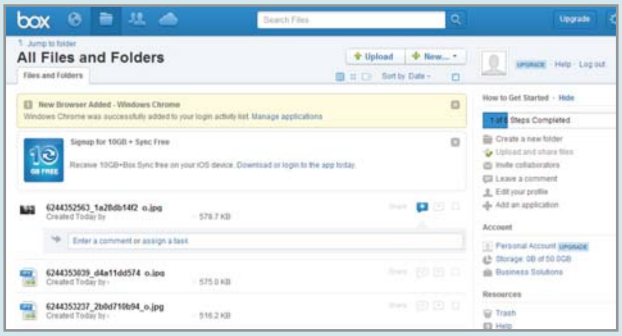
$50/year (unlimited storage); $25/year (10GB), www.crashplan.com

PHOTO STORAGE AND DISPLAY

SMUGMUG

A convenient storage site for your original, high-definition pictures (and videos!) that even allows you to transform your library of shots into a digital storefront—*and* tiered payment options? Sorry, Flickr: You might be a little cheaper in some instances, but you're not as scalable.

$40/year Basic plan; $150/year Portfolio plan (among others), www.smugmug.com

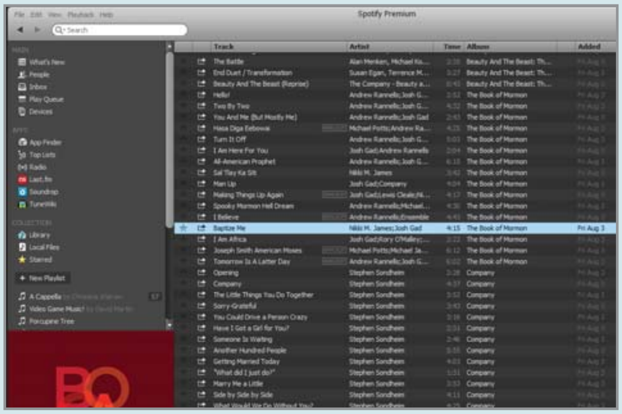


Plenty of fairly inexpensive cloud storage that's accessible via an easy-to-use web interface or an automatically synchronized folder on your PC? Sounds good to us!

CLOUD STORAGE

BOX

There are a million cloud storage options out there. We like Box because of its competitive pricing: $15/user/month for a terabyte



Spoiler: You can also sign up for a service like Rdio, which offers similar capabilities for similar pricing—check which service contains more of your favorite bands!

of storage, which blows Dropbox's $50/month, 500GB plan out of the water. Shoot, you even get more storage on Box's free plan!

$15/user/month Business plan (1,000GB storage; 2GB limit per file), www.spotify.com

ROCKING OUT
SPOTIFY

Old and busted: going through your MP3 collection, making playlists, and waiting for them to transfer to your portable device. New hotness: streaming any song you want from the ample library of Spotify songs—the ultimate road trip solution.

$10/month Premium (mobile streaming), www.spotify.com

COMMUNITY CHATTING
APP.NET

What's this? A paid-for version of Twitter that's far more open to third-party developer access than the current king of the 140-character-update hill? Perhaps paying for a microblogging service (that supports 256 characters per message and comes with no advertising) will cut down on spam accounts and other digital losers.

$36/year or $5/month, www.app.net

CALLING YOUR FRIENDS
SKYPE OUT

Be brave. Ditch your home landline phone. Switch on over to Skype and pay just 2.3 cents per minute to call landline or mobile numbers from 30 countries around the world—even cheaper if you decide to spring for a Skype subscription!

1:1 dollars-to-Skype Credit ratio; subscription services start at $3/month, www.skype.com

BUYING STUFF
AMAZON PRIME

Free two-day shipping for a vast number of products sold on Amazon? If you're an online shopping junkie, that's pretty good. Amazon's free library of streaming TV shows and movies for Prime members, and its Kindle lending library, seal the deal.

$79/year, www.amazon.com

WATCHING MOVIES AND TV
NETFLIX

Sorry, Hulu Plus—your insistence on keeping commercials in your paid-for streaming service gives Netflix the upper hand on this one. Pony up the cost of one Happy Meal per month to get unlimited TV and movie streaming across all of your Netflix-friendly devices—not bad!

$8/month, www.netflix.com

TRIP PLANNING
TRIPIT

Travel planning was never easier—or more automated. Sign up for Tripit Pro to receive all sorts of notifications about last-minute changes to your (automatically imported) travel itinerary, in addition to assistance when you're trying to find alternate flights and a centralized location for tracking your flyer miles/points/rewards across all your favorite carriers.

$49/year, www.tripit.com

VIDEO STORAGE AND PRESENTATION
VIMEO PLUS

If you're huge on video, but need an online method for archiving and presenting your work, look no further than Vimeo Plus. You'll get 5GB of uploads per week, unlimited HD uploads and embeds, and the ability to customize the very player you'll use to showcase your flicks around the web.

$10/month, www.vimeo.com

DYNAMIC DNS
NO-IP

If you're looking for an easy way to remotely connect to a computer (or network-based storage device) from afar, you'll want to use No-IP's Dynamic DNS features. All you'll have to do is remember a single, unchanging web address to call home versus a constantly changing IP address.

$15/year, www.no-ip.com

PASSWORD PROTECTION
LASTPASS PREMIUM

The LastPass app is compelling enough if you're looking for a web service that'll safely synchronize your passwords across all of your devices and browsers. The premium version lets you add additional USB-based security for accessing your account à la Blizzard's authenticator, in addition to unlocking individual smartphone LastPass apps.

$1/month, lastpass.com

THE STATE OF INDIE GAMING

HOW INDEPENDENT DEVELOPERS FOUND HUGE SUCCESS, AND WHERE THEY GO FROM HERE

BY DAN GRILIOPOULOS

Great public movements are often started in opposition to the establishment—the Civil Rights movement, Communism, even Christianity all thrived on suppression. Yet, once they'd started, these movements all took the time to define themselves and what they believed more clearly (which often resulted in internal purges). Analogously, Indie games (that is, "independent games") were also defined in opposition. By not being publisher-owned, they defined themselves against the money-grabbing publishers of the 1990s and 2000s. "We're the underdogs," they cried, "and in need of your support."

Yet the Indies never defined themselves beyond that, and we, the media, didn't help. It's hard to point to an Indie ethos today that's distinctive from that of the typical developer. With that in mind, it's worth remembering that many of the biggest developers of today, such as id and Epic, started out as Indies themselves.

That brings up a few questions. Do we want to still call them Indies? If so, does that weaken the phrase? What about companies like Double Fine, Introversion, or Team Meat? Do they stop being Indies just because they become successful, or is it more an ethos? Can an Indie employ 1,000 people?

Perhaps the more important questions are: What does it mean to be an Indie today? How is the Indie market growing or shrinking? What problems do Indies face getting the public to play their games? What tools do the established Indies use to get their games to the public? Is Indie just a state of mind?

THE EARLY DAYS OF INDIE

Many Indies operated, originally, in a solitary fashion or in very small groups, often family groups—there's a reason that Darwinia developer Introversion, the classic example of an Indie, dubbed itself "the last of the bedroom programmers." If you look at archetypal Indie developers of the 1980s—the Collyer brothers who made Championship Manager, or Andrew Gower of Runescape—they typically worked on their own from home.

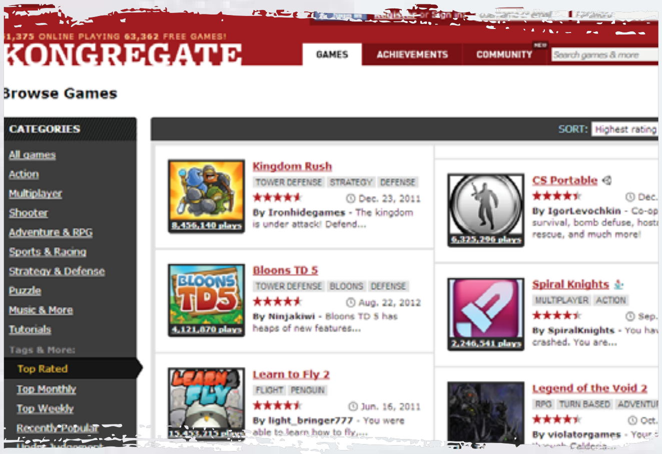
Yet when Introversion started operating, in the early 2000s, there were literally no Indie studios left—there was just no route to the customer for games developed by independent developers. Hence Introversion's slogan reflected how what had once been a thriving industry had died off—and died quickly. "In 2001, when we made Uplink, there was no digital distribution," says Chris Delay, founder and creative brain behind Introversion. "We had a website, but there was no download facility. There was no Steam. Even then, people didn't want to buy stuff from Amazon because it wasn't 'safe.' We ended up doing shop versions. The conditions weren't there to encourage an Indie scene in the early 2000s. That's why individuals didn't make games, because they couldn't sell them." The market had narrowed to just big publishers owning the route to market, and independent developers had to knuckle under or die.

Note, however, no one called themselves "Indie." The phrase can most likely be traced back to music journalism and Indie music. Post-Introversion, the Indie boom can be attributed to three things: Flash, Steam, and the iPhone.

FLASH MAKES A SPLASH

The advent of Adobe's Flash, an easy-to-program and ubiquitous platform, allowed many wannabe game developers to learn their skills quickly. Free tutorials, both from Adobe and online, gave these developers the basics of 2D game creation, and soon you couldn't avoid Flash-based games and animations.

However, few professional Indies emerged from Flash. Developers could make some money from advertisements, so animations like Homestar Runner and Weebl and Bob, could thrive, but most people developed in Flash just to get the attention and CV credentials to get employed by advertising and design agencies.



Flash opened up game development to anyone; the Flash game portal Kongregate, and others like it, brought those games to the public.

Charging money for an embedded Flash-based animation seemed crazy at the time. Flash Indies would eventually benefit from the advertising-driven dollars sent out by Kongregate, Miniclip, and other Flash portals, but these were a temporary aberration. Reportedly, Miniclip now charges developers as much as $60,000 to host their games.

So the next big step for Indies was the advent of Steam. Before this, independent developers hardly existed—the few who did lived hand-to-mouth doing contract work and rarely kept hold of the rights to their games. Many promising independent studios folded or were absorbed by larger companies. Westwood, Ensemble, Blizzard, Maxis, and many more sold out to the big publishers.

GAINING STEAM

Steam, Valve's experimental self-publishing method, debuted with the much-hyped Half-Life 2, so adoption of the service was widespread when the game released. The first third-party game on Steam was the primitive Rag Doll Kung Fu in 2005, sold for

Installations that Need Installation

We're still waiting for games to be taken seriously

Establishing games as art has been an eternal task, if not of developers then of games critics. The desire of people with a vested interest in games to proclaim them art is huge. Their opposition comes from people like film critic Roger Ebert or aesthete Brian Sewell, who have come to games later in life and can't conceive of them as appropriate sources of aesthetic appreciation.

Yet Indies are likely to win this argument by themselves. First, as we've argued already, Indie games are necessarily experimental in design and appearance, and are often created following the same conceits that all artists have when creating their work. If someone conceives of an idea about, say, the vapidity of human expression as represented by evanescent cloud formations, creative tools are now egalitarian enough for that person to realize that vision as an art installation in any media; as a painting, sculpture, video, or as a piece of software masquerading as a game.

Second, Indie games are being represented in the mainstream as creative, and their creators are being treated with the same respect as creators in other media. Films like *Indie Game: The Movie* and *Us and the Game Industry* represent Indie game makers as agonized, impoverished, and driven, using the same language and clichés that are normally applied to Van Gogh, Hemingway, or Buñuel. If art is something made by artists, then these movies will make the public who see them believe that games can be art, far more convincingly than the arguments of the media or even playing the games. (Super Meat Boy, while tremendously fun, would only undermine that argument.)

It's sad then that mainstream games and their cynical, exploitative marketing campaigns are likely only to continue providing evidence to the entrenched opposition.

the then-cheap price of $10. This game was so successful that its developers, working at EA-subsidiary Lionhead, could afford to leave and form Media Molecule, creators of the multimillion-dollar-selling Little Big Planet.

Steam has been a haven for Indie development ever since. Though Valve takes a substantial cut off the cost of a game—reportedly as much as 70 percent—it's never demanded IP rights. That, combined with the ubiquity of the service and limited number of new titles on it, has meant that a good game can make money quickly. "Steam decided it was going to be open to Indies," recalls Introversion's Chris Delay. "Things could have easily gone the other way."

The final ingredient in Indies' success was the popularity and openness of the iPhone and iPad market. Early games like Paper Toss were as primitive as Rag Doll Kung Fu, but as the hardware got more powerful and the dev tools got better, so did the games. More and more developers were attracted to the platform, which trickled back into PC.

iOS also introduced something else—new ways of making money. The extreme competition for the top spots on the iTunes marketplace meant that prices got driven lower and lower. Developers slowly moved to a free model, where they gave away limited versions of their games. This meant that players could play a game and then decide whether they liked it—which they often did. Apple helped out by allowing in-application purchases, so even the free games could make money.

GROWING PAINS

So that's how the Indie market got to where it is today. But that's also the seed of some of its problems. Valve's lackadaisical, egalitarian nature made Steam attractive to Indies, but it has also made it harder for developers to get onto the service over the last couple years, as Valve simply can't cope with the number of submissions it gets—especially as there hasn't been a clear submissions policy or route, beyond knowing someone at Valve. "It's certainly a lot harder than it used to be," says Size Five Games' Dan Marshall. "Several key games every year catch the imagination and rise to the top of the Indie Darling tree; the rest just survive or die.... You send them your game and then hear nothing back while they sift through the billions of games they presumably get sent every day."

Similarly, the iOS market allowed all sorts of developers to become Indies. However, it has also driven down prices for games in general, as developers flooded onto the platform in something akin to a gold

The iOS hit Sword & Sworcery EP by indie developer Superbrothers proves you don't need shouty dragons to be a fantasy epic.

The ability of smaller, Indie developers to quickly adapt and change leads to innovation, as with the ingenious puzzle game Braid.

rush. "Saturation is a huge worry," says Andrew Smith of Spilt Milk Studios, "but on the flipside, never before have the games tech and the delivery platforms been so mature."

Thankfully, the market is now so large it's becoming self-sustaining. For example, it now pays for middleware developers, who had previously only created multimillion-dollar game engines, to make cheap or free versions of their development kits. Epic, an old-school independent developer that had diversified into engine development, has made its Unreal Development Kit (UDK) available for free in exchange for a percentage of royalties.

Several developers I talked to had particular praise for the cross-platform development platform Unity. Free like the UDK, this toolset allows for easy creation of games across all the current games platforms—Xbox, PS3, PC, iOS, Android, HTML5, and so on. Dan Marshall, creator of Time Gentlemen, Please, can't praise it enough: "It's a great way of making games quickly and efficiently, with a load of prebaked goodies you can drag, drop, and endlessly modify. In Indie circles, when someone says they're making a game in C++, DirectX, XNA, or whatever, the catch-all follow-up tends to be 'Why aren't you using Unity?' And it's a good point. It's extremely versatile."

Unity also helps the Indies deal with another problem—the speed of change. "In the current climate, change happens so rapidly that what worked a few months ago may not work anymore," says Spilt Milk's Smith. Developers are constantly talking and sharing how the market's changing, driven partially by the eternal hunt for the new, and partially by hard metrics from their own games.

Andy Payne, owner of developer/publisher Mastertronic and chair of both the British developer association UKIE and developer consortium Appynation, says he thinks this adaptability to change gives Indies an advantage over the big companies. "The threshold of sales and revenues can be significantly lower for an Indie," he says, "so they can target smaller niches. Games like Minecraft, Limbo, World of Goo, Braid, Bastion, and Frozen Synapse have proved that talent comes through. Indies invent new ways of playing games. As software transitions from products to services, Indie fan bases will be crucial."

In that sense, incumbent developers have a huge advantage. Whether their early games were great successes or not, they have ongoing numbers about how games are selling, especially on iOS. The more games they make, successes or not, the better they get to know the markets they're making games for. Hardingham elucidates: "A fun fact I like to tell people who think that anyone can make the next Angry Birds: Angry Birds was Rovio's 150th game. There was an awful lot of experience behind it."

AN INDIE INDUSTRY?

However, there's another sense in which incumbents have an unfair advantage. This sharing, this mutual support produces a similar self-supporting circle to that in the book industry, where authors routinely praise their friends' works. In games, the outcome of this is no less corrosive to the open market as it is in books—the outcry when Indie industry insider Phil Fish won the Independent Games Festival (IGF) main prize for his game Fez was huge. This wasn't simply due to the game having been entered several years in a row, but also to the perception that he was part of a group working toward each other's mutual benefit through awards like IGF.

This isn't surprising; history's full of examples of groups bonding together for mutual benefit, such as unions or guilds. Problems only arise when these groups exclude other participants unfairly. Thankfully, this isn't a dominating factor in games yet.

Discovery, the ability of players to find new Indie games, is only getting better. The two key recent developments in this area are Steam's new Greenlight feature and Kickstarter's crowd-funding.

Kickstarter (www.kickstarter.com) is the older of the two. It's an online crowd-funding platform combining social media with marketing, and it's allowed Indies with great ideas, and/or superb credentials, and/or great marketing to get funding.

Yet using it is like twisting in a game of Blackjack; if you ask for too much money and don't reach it, then you'll get nothing. "It's brilliantly helpful, but it's a double-edged sword," says Size Five's Marshall. "I'm aware that some Indies are regretting going down that road because all their backers think they're publishers and deserve a say in the game's design. I've also heard they're living in perpetual crunch, because backers won't tolerate the concept of a day off. So long as you can juggle it, it's really helpful." Similarly, it's little use to new developers: "If you're fresh out of college, don't expect anyone to believe your claims and throw money at you," says Smith.

Meanwhile, Greenlight is Valve's big idea for dealing with the problems of developer access to Steam that we talked about earlier. It's, again, a crowd-sourced approval platform, similar to the Steam Workshop, which aggregates mods for games like Skyrim and Team Fortress 2, and allows registered Steam users

Valve's crowd-sourced Greenlight approval platform lets the Steam community decide which new games are worthy of attention.

to vote for their favorites. Spilt Milk's Smith is in favor: "It puts the emphasis on having fans who believe in your game and your team, which is a very sensible and self-regulating system. It also forces Indies to get involved with PR and marketing to a certain extent, and that's a good thing, in my book—too many just ignore it."

Similarly, Marshall of Size Five thinks it's going to clarify the "previously-unknown submission process.... Greenlight probably isn't a perfect system, but I trust in Steam enough to tweak or modify it."

It's hard to know how big the market for Indie games is—given the lack of a coherent definition, no one's really been tracking it as an industry. Yet, when a one-man game like Minecraft can sell upward of 4 million copies; when Indie dominates the bleeding-edge of gaming; when games as challenging as Braid, Pathologic, and The Binding of Isaac can be commercial successes; when all these stars align, you know it's going to be a great time for gamers. Hardingham probably sums it up best: "I feel immensely lucky to be a part of it right now—something new and exciting happens every single week! One day, I'll be telling my grandkids about the Indie explosion of the early twenty-teens."

What Will the Next Indie Platform Be?

New fronts open up in the living room

You already have Indie games on your PC, your phone, and your console. Next, they'll be on your TV. Four companies are driving toward this: Valve, Apple, Gaikai (just bought by Sony), and OnLive.

Valve's plan is the simplest; it wants your PC games to look their best when run through your TV. This is Steam's Big Picture Mode. (See story on page 62.) Apple, with its set-top box Apple TV and companion software AirPlay, allows TV viewing of AirPlay-enabled iPhone and iPad games. Players (equipped with the latest version of Apple TV, and an iPhone 4S or newer, or an iPad 2) can use their devices as controllers and watch the action "mirrored" through their Apple TV.

The last two players are very different. They come from a background in streaming games to any device and it's this that gives them their advantage. Such a big advantage that Sony bought Gaikai for just over $380 million, with plans to use it just in its TV division (or so they say). Similarly, Samsung has made a deal with OnLive to carry its streamed games on its forthcoming Smart TVs.

This is likely to be the next platform that the multiplatform developers target. Though Spilt Milk's Smith sounds a note of caution—"We'll see the big boys trying to squeeze out the indies quickly"—others are excited. Marshall has already spoken to Gaikai and OnLive and says, "they're pretty open already and really keen." And Mode 7's Hardingham confirmed that his Frozen Synapse game will be on OnLive soon: "This is a good space for Indies—OnLive and Gaikai do not need to spend large overheads for new games."

The big difference with this platform is that the only limitations to the end user are their game controller, their Internet connection, and their television's resolution. Everything else is completely pliable; it's entirely plausible that developers could write games that take advantage of server farms, which are far more powerful than any standalone PC. That sort of processing power could eliminate loading screens and frame rate problems entirely.

iFixit presents:

AUTOPSY

THIS MONTH WE DISSECT...

Kindle Fire HD

About iFixit

iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.

BACKGROUND:

When Asus's Nexus 7 arrived on the scene, it made short work of kicking the original Kindle Fire to the curb. But Amazon struck back with the 7-inch Kindle Fire HD. With the help of iFixit, we can see what it's made of, literally.

MAJOR TECH SPECS:

- 7-inch 1280x800 HD display with IPS (In-Plane Switching) technology
- 1.2GHz dual-core processor with Imagination PowerVR 3D graphics core
- Dual-band, dual-antenna Wi-Fi (MIMO)
- Dolby audio and dual-driver stereo speakers
- Front-facing HD camera
- 16- or 32GB internal storage

KEY FINDINGS:

- Amazon has an easy-to-open tablet that's 0.1 mm thinner than the Nexus 7. We've said it once, and we'll say it again: You don't need to sacrifice thinness to make a repairable device. A plastic opening tool quickly removed the back case to reveal our first glimpse at the internals.

- The Kindle Fire HD gets its spark from a 3.7V, 4400mAh, 16.43Wh Li-ion battery that—as in most mobile devices—dominates most of the inner real estate.

- The motherboard—which is the second-largest killer of real estate inside the Kindle Fire HD—is home to various chips including Samsung flash memory and memory controller, RAM, a Broadcom multifunction chip with GPS, Bluetooth, and FM receiver/transmitter, an ultra-low power stereo codec, and Wi-Fi.

- The backside of the board is mostly blank, save for the InvenSense gyroscope/accelerometer and one of the two Wi-Fi antennas used for MIMO technology.

- Amazon hid the Texas Instruments OMAP processor underneath the Hynix RAM chip. The TI OMAP 4460 dual-core processor is an upgrade from the standard Fire's 4430 processor.

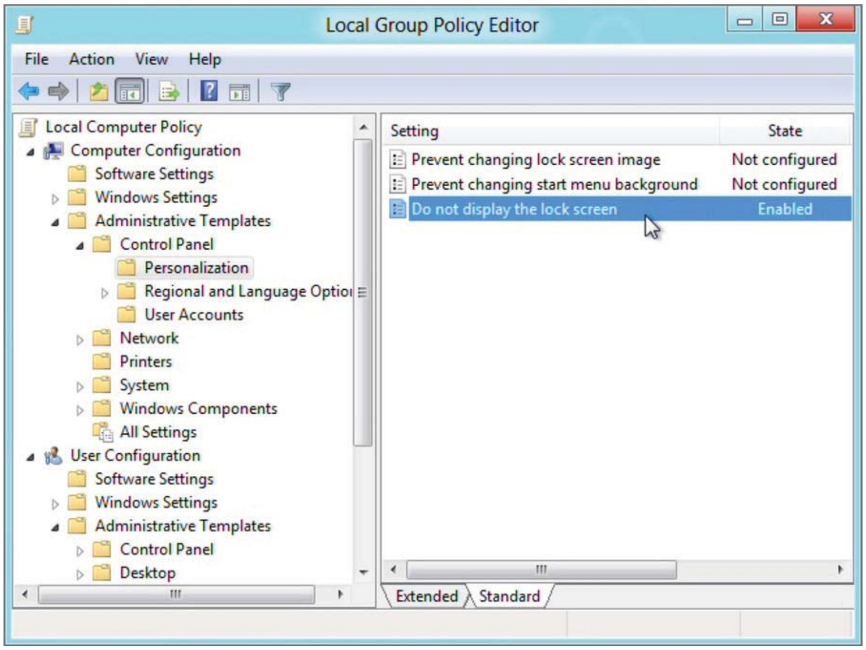
- Once the battery and the motherboard have been removed, the inner framework can easily be lifted off the LCD assembly. Bad news, everyone: The LCD and front glass panel are fused together. This means you have to replace the entire assembly as one unit rather than two separate entities.

- Kindle Fire HD repairability: 7 out of 10

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

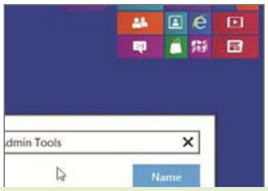
WINDOWS TIP OF THE MONTH



DISABLE THE WINDOWS 8 LOCK SCREEN

If you want to disable the lock screen in Windows 8, open the Group Policy Editor (run GPEdit.msc) then browse to Computer Configuration > Administrative Templates > Control Panel > Personalization. There, double-click and enable "Do not display the lock screen."

MAKE - USE - CREATE



58
Access Admin Tools in Windows 8

60
Enable Big Picture Mode in Steam

ALEX CASTLE
CONTRIBUTING EDITOR

THE MAGIC SCREENSHOT

ONE OF THE most important applications I keep installed on my PC is one of the simplest—a lightweight, powerful screen-capture program. The one I use is called Greenshot (available for free at www.getgreenshot.org), but all that matters is that you use a program that allows you to take and automatically save a screenshot at the press of a button.

What's great about screenshots is that, with so much of modern life taking place on a computer screen, they provide a fail-safe way to remember important things. Receipt from an online order? Take a screenshot. A friend tells you something important in an IM? Take a screenshot. See a game on Steam that you might want to buy later? Take a screenshot.

There are programs, like Evernote, designed to make this sort of "clipping" more organized, but I find that I sometimes get too caught up in the extra features, and nothing beats the speed and simplicity of a screenshot.

↘ submit your How To project idea to: comments@maximumpc.com

Access Your Favorite Admin Tools in Windows 8

YOU'LL NEED THIS

WINDOWS 8
Microsoft's latest OS is available in Release Preview form at http://windows.microsoft.com/is-IS/windows-8/download.

YOU HAVE TO ADMIT, Microsoft has taken a sizeable gamble with the design of Windows 8. Some commentators say the company simply has to change the way it operates if it wants to gain any traction in the tablet and smartphone market, and with the new operating system's touch-oriented model, it has certainly started down that path. The Windows interface has undergone a radical rethink in terms of both operation and interactivity.

For us desktop users, it represents a massive change from what we've become accustomed to over the years. Gone is the desktop as we've come to know it and, most jarringly of all, gone is the Start menu that we've come to love since the heady and somewhat dysfunctional days of Windows 95.

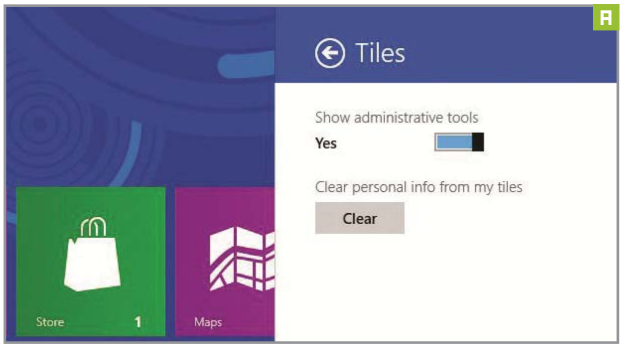
But there's no need to worry—all we're looking at with Windows 8 is essentially a re-skinned version of Windows 7 with some fancy new GUI components dropped in on top of it. As Microsoft itself says in the reviewer's guides it sent out to the media: It's Windows 7, only better.

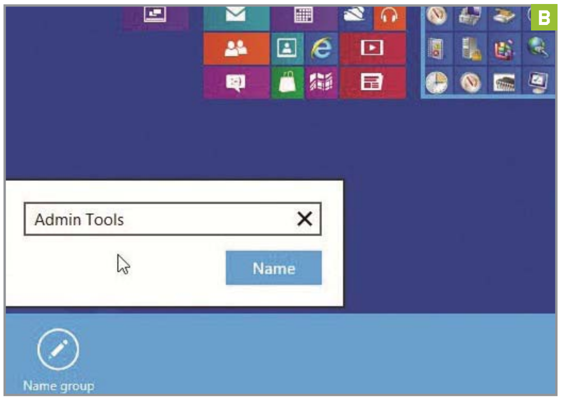
In this how-to, we'll show you how to access all the administrative features and tools you've come to rely on, in Windows 8. –DAVE JAMES

1 UNLOCK THE ADMIN TOOLS On the new Windows 8 Start screen, start by bringing up the Charms bar from the right-hand side of the screen and clicking Settings. Then select the Tiles menu and slide the bar that says "Show administrative tools" to the right (**image A**). Now just tap anywhere on the main screen to remove the Charms bar, and the full set of administrative tools will be displayed.

» When these tools appear, they may be mixed in with various other shortcuts, but we'll show you how to tidy them up. You can group icons together on the Start screen with a few clicks. First, minimize the icons by hovering the mouse over the bottom right corner and clicking the minus symbol. You can now see the individual groups by right-clicking them.

» When you right-click, a bar will appear at the base of the screen giving you the option to name the group. Once you've entered a name here (**image B**), you can zoom back into the Start screen and move individual icons between groups. Return to the minimized view and you can move entire groups around by dragging and dropping them into your preferred place.





2 SET UP AUTOMATED BACKUP One of the most important administrative features in any OS is file backup, and Windows 8 makes it easier than ever to quickly protect all your important files. The new File History app lets you select a device to use for automatic backups for your desktop and Libraries. First, enter the Control Panel and start File History.

» If you haven't plugged in your USB stick or other storage device, now is the time to do so. The drive will appear in the window, and File History will be switched off. Click "Turn on" to begin syncing your content to the drive (**image C**). You can exclude a particular folder by selecting it in the "Exclude folders" option, and add Libraries by creating new ones and filling them with folders (**image D**).

» The advanced settings will let you specify how long to keep outdated versions of files, and how often to back up the whole lot. If you delete a file from your main drive that you then need to back up, you can

use Restore Personal Files to select an appropriate restore point. You can even drill down through the backups to see which files are in each option.

3 FIND FAMILIAR MENUS AND FEATURES

All your favorite system tools from earlier versions of Windows are still present, but they may have moved or gotten a face-lift. Here's a "Where are they now?" look at six key Windows admin tools.

STARTUP

It was once hidden within the murky depths of msconfig, but the Startup tab has received a promotion and found itself a home in the new Task Manager. It still has the same level of functionality as before, allowing you to customize which programs load when you boot your machine, but it's now much easier to access than before. You can also travel directly to the file location to see a rundown of the impact it has on your boot time.

PERFORMANCE

This is another example of the improvements Microsoft has made to the Task Manager, and will be of particular interest to power users. Previously, the main screen on the Performance tab only displayed a graph of your machine's CPU usage, with a little extra detail about memory. Now, there's information about everything from processor speed to the read and write speeds of your drives. This provides a comprehensive idea of how your machine is performing (image E).

SYSTEM INFORMATION

If you don't necessarily want to know how your machine is performing, but are looking for the details of your PC's components (from a software or hardware perspective), the System Information screen is the place for you. It will give you the full lowdown on every facet of your machine, from the drivers for your mouse to the layout of your drive partitions.

WINDOWS FIREWALL

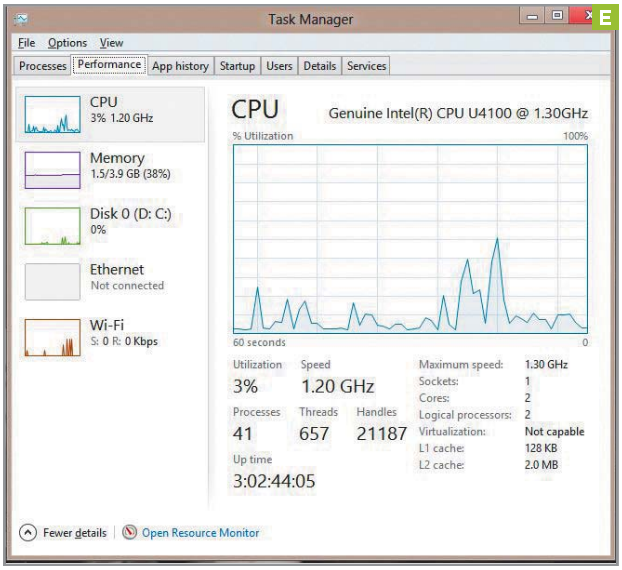
Nothing has really changed with the latest iteration of Windows Firewall and Advanced Security. It's still the place to go to fully customize your firewall settings, whether you want to import new exception policies or diagnose any kind of network/security problems. It also allows you to monitor how your current network connection is configured (image F).

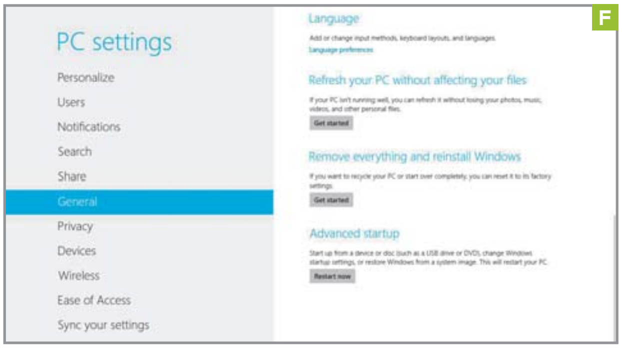
BOOT INTO SAFE MODE

Boot times in Windows 8 have improved, but with an SSD installed as a boot drive, it can be tricky to boot into Safe Mode. Luckily, you can access it via Advanced Boot Options, which is accessible through the extra settings on the Charms bar. If you hit Advanced Startup under the General tab, the PC will restart into Windows 8's debug mode.

RESET WINDOWS 8

Your computer now has a function similar to the factory reset option on your smartphone, accessible via the PC Settings screen on the Charms bar. It gives you two options—you can either refresh the PC without losing any of your personal files (such as photos and music), or you can perform a total system reset, which will revert your PC to its original state.





Enable Big Picture Mode in Steam

YOU'LL NEED THIS

STEAM
This guide is for Valve's Steam service. Download it free at http://store.steampowered.com.

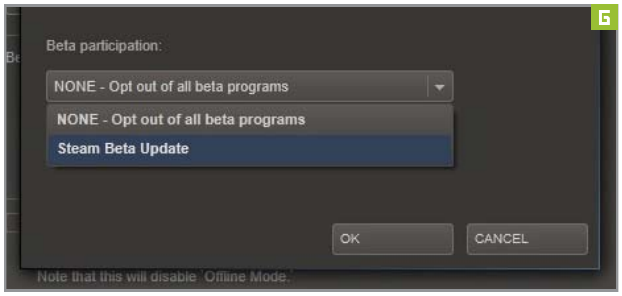
AN HTPC
Big Picture Mode is only relevant if you've got a large display to hook up to your PC, and a game controller or wireless mouse and keyboard.

VALVE HAS RELEASED Steam Big Picture Mode, a revamped, console-style user interface designed for using Steam on your TV, from the comfort of your couch. If you use Steam on an HTPC or a living room gaming PC, you should try it out right away.

The only problem is that Big Picture Mode is currently in open beta testing, and finding out how to opt into the beta can be tricky. Detailed below are steps to help you get Steam's new Big Picture Mode running smoothly on your big-screen TV. –JIMMY THANG

1 OPT IN The first thing you'll want to do upon booting Steam is click the Steam drop-down menu at the upper left and then select Settings. A menu will pop up. From here, under the Beta Participation section, click the Change button.

» Another pop-up menu will appear; select Steam Beta Update from the drop-down menu (**image G**). Steam will then ask you to restart the program. Do so. Steam will take a couple of seconds to update.

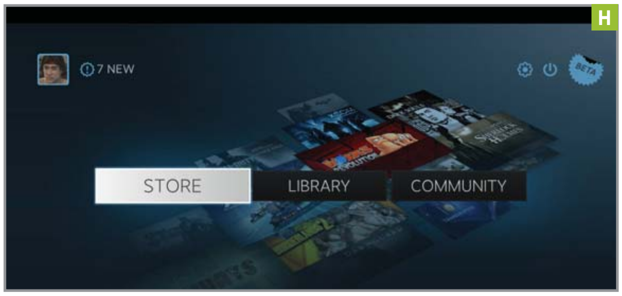


G

2 ENABLE BIG PICTURE MODE Once Steam reloads, you'll notice a new Big Picture icon in the upper right-hand corner. Click it. After a brief intro animation, you'll be in Steam's Big Picture Mode (**image H**).

» You'll find that Steam Big Picture Mode allows you to easily navigate its interface from the comfort of your relatively distant couch or bed with the assistance of your favorite game controller. While you can certainly use a keyboard and mouse, we can tell Valve spent a lot of time tailoring the experience for USB-powered Xbox 360 controllers.

» Now that you've gotten into the Steam big-screen beta, you might be wondering how you get this new interface onto your HDTV.



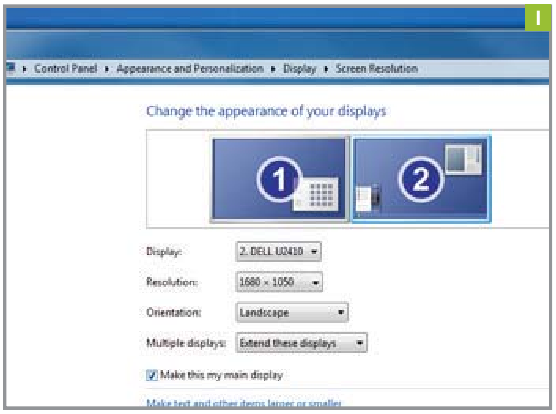
H

3 USE YOUR HDTV AS A DISPLAY If your HDTV is connected to your PC via HDMI, doing this is easy. On Windows 7, simply right-click anywhere on an empty portion of desktop, then click Screen Resolution. From here, select your TV and click the "Make this my main display" checkbox (**image I**). Select OK. Now your nice, big-screen TV will be your primary monitor (you can always switch back when you're done using Steam's Big Picture Mode).

» Before you boot Steam, you'll also want to enable your TV to play your PC's audio. To do this in Windows 7, right-click the speaker icon on the lower right-hand corner of your desktop, select Playback devices, choose your TV's speakers, press the Set Default button, then press OK.

» Voilà! Now your TV is configured to take full advantage of Steam's new Big Picture Mode.

For information about choosing the best PC and peripherals for a living-room gaming rig, see Build It on page 66.



I

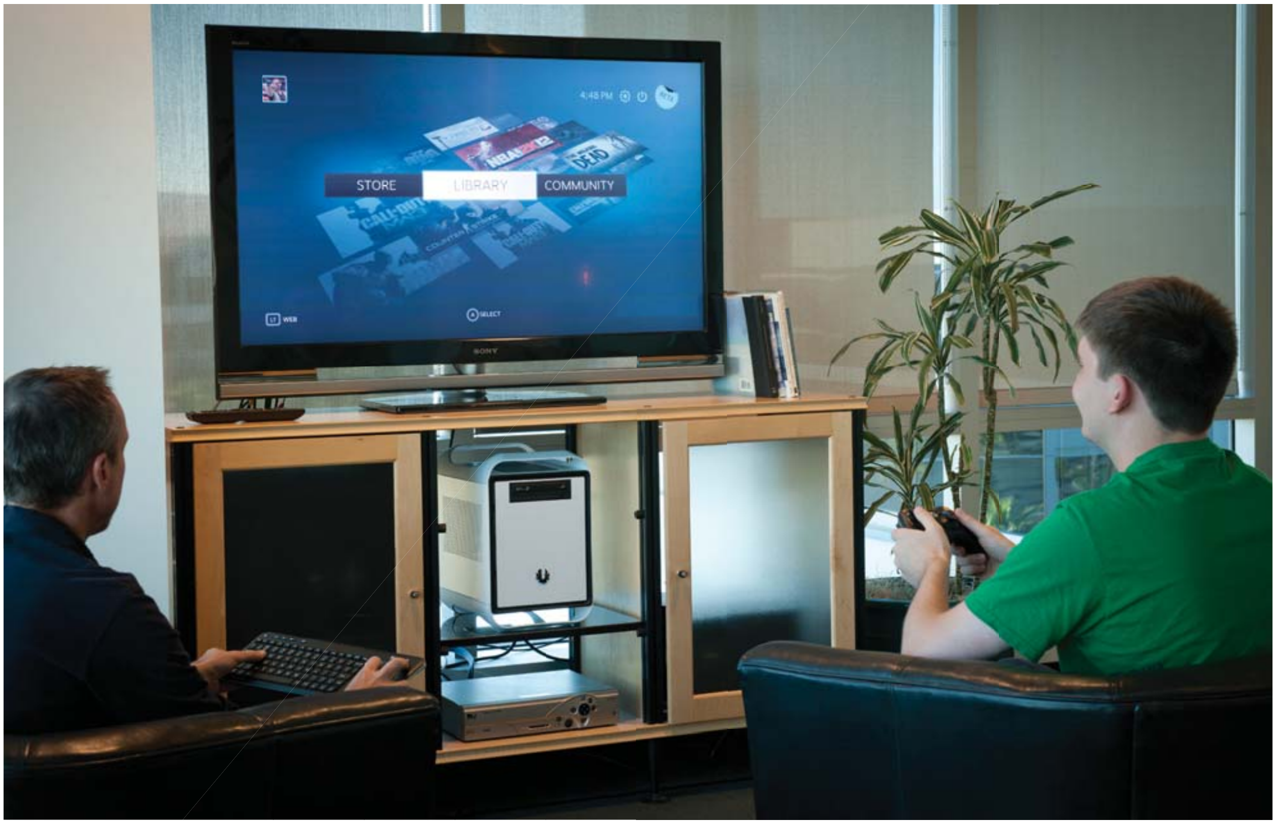
BUILD IT

BY JOSH NOREM **EDITOR**

Set Up the Ultimate Steam Box

Now that Valve Software's Steam service has a 10-foot interface, named Big Picture Mode, it's time to build a small gaming box that can be controlled from the couch

LENGTH OF TIME: **2 HOURS** | LEVEL OF DIFFICULTY: **EASY**



THE MISSION As PC gamers, we're big fans of Valve Software's Steam service and can't imagine life without it. We've got a huge library of installed games, all of our friends are on it, and almost every AAA title is released on Steam, making it indispensable. The only "problem" with Steam has been that its interface was designed for sitting 24 inches away, at a monitor, making it incompatible with couch-bound gaming. Valve has rectified this dilemma with its recently launched Big Picture Mode, which slaps a 10-foot interface on top of Steam and makes it easy to control with a gamepad. Since distance and connection issues can get in the way of running your desktop PC on your HDTV screen, we're going to walk you through a more workable solution. First, we will advise you on selecting a small-but-powerful PC that's suitable for a living room, then we'll walk you through selecting appropriate peripherals, and finally we'll show you how to get it all up and running, ready for Big Picture Mode deployment.

1 GET YOURSELF A LIVING ROOM PC

IF YOU'RE like us, you already have a desktop gaming PC that lives in a separate room, semi-far away from your television. Here in San Francisco, we reside in homes so cavernous that oftentimes our living room and bedroom or office are roughly 20 feet apart from each other, and don't even get us started on our spacious bathrooms and ample parking options (this is sarcasm). Seriously though, space constraints aside, we like to keep our PC out of the living room since it's big, somewhat noisy (despite our best efforts), and resides under a desk large enough to qualify as a studio apartment in the Bay Area. The living room is reserved for TV watching and Netflixing, and the only gaming it ever sees is on a board, typically. However, now that Steam offers a Big Picture Mode interface that can be controlled from across the room, we'd like a dedicated Steam box chillaxing in our living room so we can play some PC games from our couch.

To accomplish this feat, we had two options—buy or build. Anyone who reads this magazine knows the route we took, but there are also a couple of worthwhile rigs for folks who don't want to get their hands dirty. For the more budget-conscious, Alienware's X-51 has an elegant and amazingly thin chassis that can be had for as little as $800 (it received a 9 verdict in our May 2012 issue). If you're willing to part with a bit more cash, Falcon Northwest has a new slimline rig called the Tiki that's just 4 inches wide (pictured on right). The baseline Core i5/GTX 650 combo will set you back $1,600, but Core i7 and GeForce GTX 680 are also options, if you can afford it (see our review in the September 2012 issue). Though both of these machines would look great in a living room, we chose to build a system because that's what we do here, and because we have a perfect template for this task: the "Small but Mighty Gaming Rig" from our October 2012 issue (Build It). If you can't find the issue in your man cave, you can also see the build-it deets online at bit.ly/R6L1AM.

2 PREPARE YOUR RIG

THE RIG WE built for this job splits the difference between a full-powered gaming machine and a small form factor PC. We know—technically, it's a small form factor PC since it has a tiny Mini-ITX motherboard, but that board houses some kick-ass components, including a water-cooled Intel Core i5-3570K processor, a 240GB SSD *and* 3TB HDD, and an overclocked GeForce GTX 670 from MSI. In our benchmarks, this little rig cranked out 76fps in Batman: Arkham City at 2560x1600, which is more than enough muscle for gaming on our TV. That's one hell of a PC, and the fact that it's not any taller or wider than a roided-out Chihuahua is icing on the cake.

3 CHOOSE THE PERIPHERALS

AS DESKTOP commandos, we know exactly which mouse and keyboard combo we usually prefer, but that all changes when you move to a softer, more comfy location like the couch. We needed a keyboard that was light and wireless, and we decided against a mouse simply because neither our legs nor our couch is flat enough to provide an accurate mousing surface. We also needed to select a gamepad that works well on a PC, and it's slim pickings these days as most gamers just use a mouse and keyboard.

KEYBOARD

To satisfy both our mouse and keyboard needs we went with the sublime Logitech K400 Wireless Touch Keyboard (below)—not to be confused with its predecessor from the 1980s, the *Invisible Touch*. The K400 is incredibly light but provides comfortable keys and a surprisingly accurate touchpad with vertical scrolling support that makes browsing the web and navigating Steam's interface a cinch. The keyboard's 30-foot wireless range is more than sufficient, and its slim profile comes in handy when we need to stow it inside our entertainment center. We also like the fact that the included AA batteries will last up to a year; we just have to remember to turn off the keyboard when not using it.

GAME CONTROLLER

We debated for quite a while over which game controller to choose before settling on an old standby, the Xbox wireless controller for PC. We like that it's comfortable, easy to set up, and it works perfectly. We could have saved some money by going with something from Saitek but we like the build quality and heft of the Microsoft controller. Say what you will about Microsoft's ability to craft a touch-based OS, but the company knows how to build a peripheral, that's for sure. The wireless dongle is also easy to tuck away in our rat's nest of cables.

4 CONNECT TO THE NETWORK

POWERLINE NETWORKING has overcome most of its initial teething issues and has turned into a reliable and fast alternative to wireless. Obviously, running a gigabit hardline would be the best option, but that's not always an option. And while wireless is the easiest option, it's also prone to problems if you live in a dense area where several routers are stomping on each other. Thus, we opted for powerline networking. We can plug our router into a power outlet in our office, then connect the Steam box to a power outlet in our living room and be done with it.

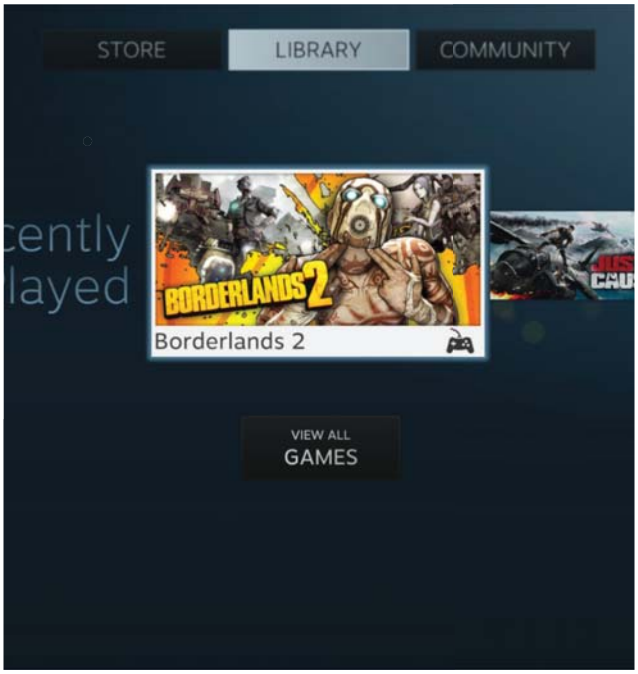
The kit we chose was the winner of our powerline-networking roundup in the December issue, the TP-Link AV500. This $95 kit was the fastest kit we tested, with 66Mb/s average read speeds, and the least expensive, so that's a win-win in our book. We also like how the LEDs on the front of the units show us how fast our connection speed is.

Setting it up was as simple as plugging one unit into a wall socket, then connecting the cable to the LAN port on our router, and pressing a button on the adapter to begin the syncing process. We then connected the second adapter to a power outlet behind our entertainment system, and ran CAT5 cable from the adapter to our Steam box. After we pressed the sync button on the second adapter, we had a signal in about 45 seconds and were able to get online.

5 ENTER BIG PICTURE MODE

WITH OUR RIG connected to our HDTV, all of our peripherals functioning, and our Internet connection humming along, we installed our OS (Windows 8 Pro), went directly to www.steampowered.com, and installed the Steam client. Big Picture Mode is not enabled by default, so we followed a few steps to enable it (that process is covered in depth on page 62), which involves opting in to the Steam Beta program. Once we restarted Steam, we found a Big Picture button in the upper right-hand corner, so we clicked it to activate Big Picture Mode.

The interface is extremely easy to navigate, with everything nicely organized into big boxes that are easy to see, even from the couch. We attempted to navigate the UI with our Xbox controller but found we prefer using the Logitech keyboard/touchpad just because it was easier to move our finger on the touchpad and it's what we're used to. The main screen lets you choose between the Store, Library, and Friends list; we dove right into our Library. Games are organized just like in regular Steam, so we could see installed games, games we played recently, and even games that support a controller—a very nice touch, and an indication that Steam took the implementation of Big Picture Mode seriously as opposed to just overlaying a bigger skin on top of Steam. BPM also includes a web browser as well as a home page portal that includes Facebook, Twitter, Google, and our other "favorites," which are easily customizable. Is it possible that someday we'll boot into a Steam OS with all our games, our favorite web browser, and our files hosted in the cloud? We shall see.



LET OFF SOME STEAM

Four games that play great from the couch

We'll be the first to admit that we're not the most avid living room gamers, but that shouldn't come as a surprise to you. We're typically found at our desks playing Borderlands 2, BF3, or DayZ, so playing with an Xbox controller is sort of akin to a dog walking in sandals. We did, however, find some games that are awesome with a controller, and we highly recommend you check them out.

PORTAL 2

We loved Portal 2 on the PC, and though the placing of portals and dropping of the companion cube took a bit of practice with the controller, we eventually figured it out and had a blast playing this game from our couch. Since you rarely have to use twitch movements to accurately aim yourself when being flung through the testing facility, a controller works just fine.

DIRT 3

We've always been a fan of racing games on the PC, and as much as it pains us to say it, they are even better with a gamepad. We were able to sit back and comfortably shred the snow-capped courses of Dirt 3 while drifting to our heart's content.

PSYCHONAUTS

Psychonauts is an oldie but a very, very goodie and it plays extremely well on a huge TV and with a gamepad. The Xbox controller is especially useful for all the jumping puzzles the game throws at you, even the horrific ones contained in the Meat Circus.

MOTOGP 08

MotoGP 08 was designed for gamepad use and it's bloody awesome. Controlling the bikes is almost as easy as actually riding a MotoGP bike in real life—or so we imagine. The main advantage is being able to hold a lean angle through the corners, with a smidge of pressure on the controller stick, which is much easier to pull off with a controller than trying to half-press a keyboard key.

The good old days of MotoGP—Stoner on the Ducati and Rossi on the Yamaha.

PUZZLE QUEST

To be honest, we never got that into this game's sequel, and prefer the original. We just appreciate the simplicity of the game mechanics, and love going up against an ogre or orc and unleashing a deadly chain of attacks. Having the huge display with much larger blocks than we're accustomed to made it easier to evaluate our options before making a move, and it also made navigating the world map a bit easier, as well.

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

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V3 Traverse

The march of small machines continues

THE ENTHUSIAST PC market seems to be experiencing a bit of bipolar disorder these days. It's either represented by massively huge systems so big they blot out the sun, or teeny, tiny boxes that you could slip under your arm and then skateboard to a LAN party.

The V3 Traverse falls into the latter category. Built in BitFenix's cool little Prodigy case, the Traverse is a kissing cousin to the "Small but Mighty Gaming Rig" from our October 2012 issue (Build It). Well, except that the Traverse is a full-on freedom-kiss in the graphics department. We've seen snaps of the BitFenix Prodigy with a dual-GPU card in it, but we were skeptical until now. The V3 Traverse sports none other than the fastest card in town: a GeForce GTX 690. Cracking open the Traverse, we were literally shocked to see the entire box running on a Corsair CX600 PSU. Why the amazement? We're just so used to dual cards sucking up power by the megawatts that a "mere" 600 watt PSU seemed surprising.

With the GeForce GTX 690 rated to consume 300 watts of juice, that doesn't leave much for the rest of the system. V3 gets away with the smaller PSU because the Mini-ITX board and case don't allow you to build out to, say, five hard drives and a crapload of other accessories. Still, it's probably a bit less headroom than you'd like, especially on sweltering days when the temperature in your room is 85 degrees and the temp inside your case is a balmy 130 degrees or more.

This brings us to a real snag, though. V3 tapped the budget wonder known as Intel's Core i5-3570K to run this show. The CPU's temps are controlled by closed-loop liquid cooling, and it's overclocked from the stock 3.4GHz to 4.8GHz. That's quite a leap for an Ivy Bridge using a closed-loop cooler. In our October build, we opted for a more conservative 4.4GHz using a different closed-loop liquid cooler.

Right off the bat, the V3 Traverse coughed up a BSOD in our Stitch.Efx 2.0 benchmark. V3 advised us to add a little core voltage and clock it back 100MHz to 4.7GHz and drive on. We did that and experienced no further stability issues in any of our benchmarks, including multiple heavily threaded encoding benchmarks. When we finished, though, we decided to execute a cursory Prime95 load on the box—something we do with all overclocked machines we review or build. Within 10 minutes, the machine again blew a BSOD. That's not good and made us wonder how carefully the company had vetted the overclock. V3 assured us it had done extensive stress-testing before the box shipped. Obviously, something wasn't right.

In performance, the Traverse is no slouch. Our dataset of systems that have run our new benchmark gauntlet isn't huge, but the GeForce GTX 690 is a tough one to beat. In gaming, in fact, the Traverse was the second-fastest box we've tested, behind our quad-SLI Dream Machine. The compute-bound tests also saw the Traverse with pretty respectable scores, for a non-Hyper-Threaded processor. To put some perspective on Hyper-Threading's value in multithreaded tasks, the miniature Polywell we reviewed in October, with its stock-clocked 3.4GHz Core i7-3770, is damn near as fast the 4.7GHz Traverse in our Premiere Pro CS6 test, and faster in the x264 video encode test. In workloads that can't load up the processor, however, the Traverse's high clocks put it well ahead of the diminutive Polywell.

Our real issue is the instability. We can accept having to tune the box down one time, but a spontaneous reboot within 10 minutes of a Prime95 load after applying the recommended fix is a pretty big negative. For what it's worth, we clocked down to 4.6GHz and ran Prime95 for an hour with no issue. Obviously, if the box were stable out of the box, we'd recommend it, but our experience was less than satisfactory. –**GORDON MAH UNG**

VERDICT 5

V3 Traverse

+ V 1984 Amazingly small while packing a dual-GPU card.

− V 2009 Unstable; a tad noisy under load.

$2,500, www.v3gamingpc.com

SPECIFICATIONS

Processor	Intel Core i5-3570K@4.7GHz
Mobo	Zotac Z77 ITX
RAM	8GB DDR3/1600
Video card	GeForce GTX 690
Sound card	Onboard
Storage	120GB Corsair Force GT SSD, 1TB 7,200rpm HDD
Optical	Blu-ray combo drive
Case / PSU	BitFenix Prodigy / Corsair CX600

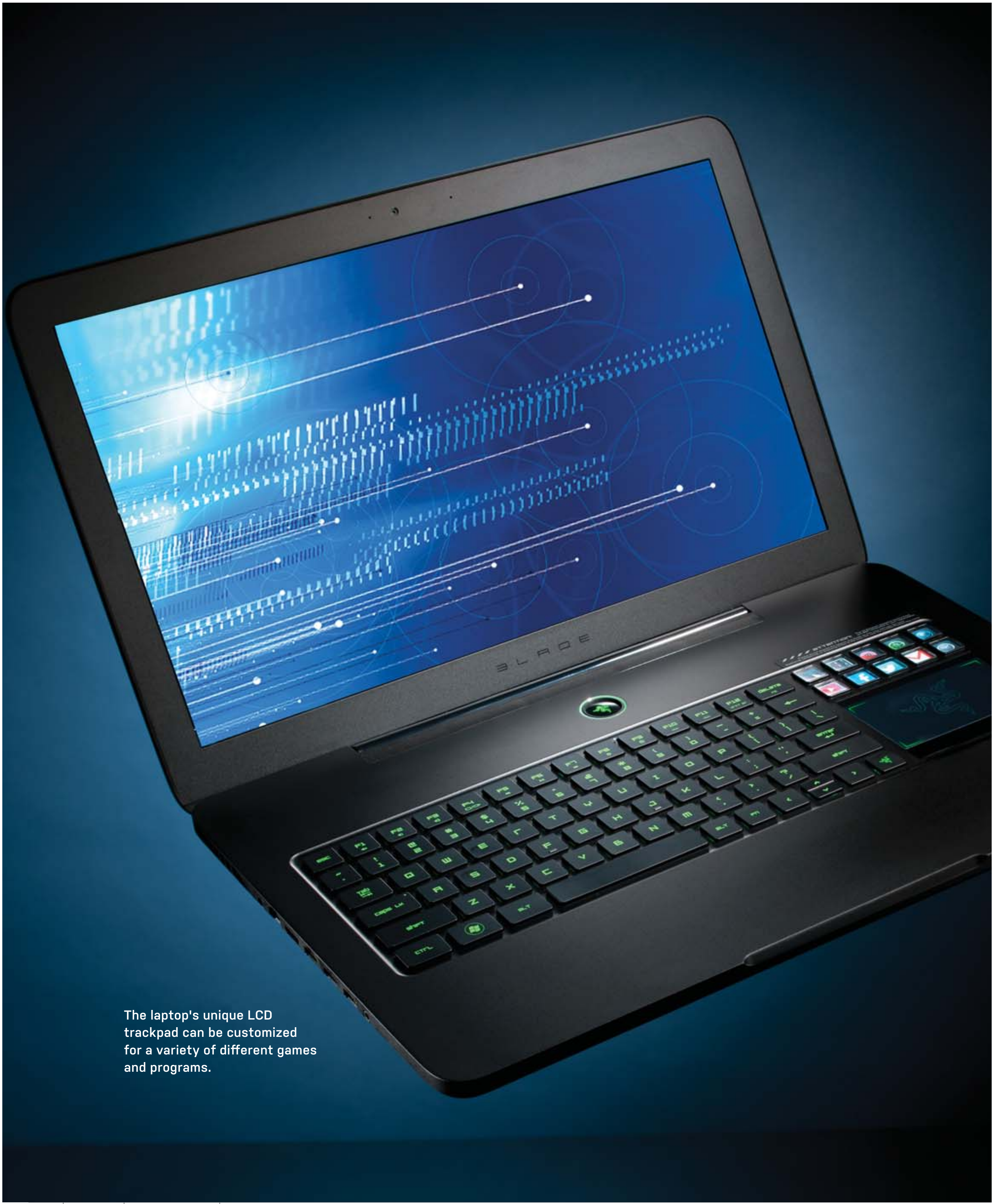
BENCHMARKS

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	3,180 (-37%)
Stitch.Efx 2.0 (sec)	831	789
ProShow Producer 5.0 (sec)	1,446	1,216
x264 HD 5.0 (fps)	21.1	15.3 (-27%)
Batman: Arkam City (fps)	76	109
3DMark 11	5,847	5,845 (0%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

Measuring 16x10x14 inches, the V3 is the smallest box we've tested with a GeForce GTX 690.



The laptop's unique LCD trackpad can be customized for a variety of different games and programs.

Razer Blade

Sharp design at a dull price

GAMING LAPTOPS tend to push garish, over-the-top designs these days; the second-generation Razer Blade throws these clichéd conventions out the window. The result is a 16.8x10.9x.88-inch minimalist laptop that resembles a large matte-black MacBook Pro. This doesn't mean the Blade looks plain, however. Its alluring green LEDs coupled with its slick LCD trackpad give this Blade a killer edge.

Featuring a 17.3-inch screen, the laptop is massive. But, while the Blade certainly sports a large footprint, it's sexy-slim at .88 inches. While the laptop doesn't feel light, with a carry weight of seven pounds, seven ounces, it's much lighter than most competitors in its class. Heck, our 15-inch MSI GT60 zero-point (reviewed last month) was noticeably heavier at 10 pounds.

The brain behind the beauty is Intel's 2.2GHz Core i7-3632QM quad-core CPU, which clocks up to 3.2GHz with Turbo Boost. Discrete graphics come courtesy of Nvidia's GeForce GTX 660M GPU with 2GB of GDDR5 video memory. Unlike the MSI's GTX 670, which uses the older 40nm Fermi architecture, the Blade's GeForce is based on the 28nm Kepler chipset. Regardless of the new architecture, the Blade's 660 couldn't match MSI's 670 GPU, losing to the latter by double-digit percentages in both our STALKER: Call of Pripyat and 3DMark 11 benchmarks.

In our more CPU-intensive tests, the laptops traded blows. The GT60's 100MHz-faster 2.3GHz Core i7-3610QM processor performed slightly better in our Stitch.Efx 2.0 and ProShow Producer 5 tests, but lost to the Blade's newer Intel CPU in our x264 benchmark by a slightly wider margin. In terms of battery life, the Blade didn't fare quite as well. Looping an HD movie off the hard drive, the Blade's 60-watt-hour battery lasted two hours and 44 minutes, compared to our zero-point's three-plus hours. Of course, machines of this size generally don't travel far from a power outlet.

We're more disappointed by the Blade's storage offering, which primarily consists of a 500GB HDD (that's half what the far-cheaper GT60 offers). But what the Blade lacks in capacity, it makes up for in speed. Along with its 7,200rpm hard drive, the Blade features a 64GB SATA 6Gb/s SSD. As a result, the laptop booted to Windows in 24 seconds. Our zero-point took more than twice as long.

As for the screen, the laptop's 1920x1080 LED-backlit LCD looks great if you're viewing it head-on, but it does have the characteristic TN shimmer when you view it off axis. What really sets the laptop apart is its multitouch LCD trackpad. The mini panel looks slick and plays games surprisingly well. It's certainly not as quick and precise as a real mouse, but it's about on par with an Xbox 360 controller for shooters. The 4-inch LCD screen also acts as a secondary 800x480-resolution monitor that's aided by 10 programmable LCD buttons, allowing you to, say, watch YouTube videos, check your Facebook page, or surf the web between loading screens. The worst thing about the trackpad is its placement on the right side of the keyboard; because we've been conditioned to using a trackpad below the keyboard, having it on the right felt extremely counterintuitive and definitely took getting used to—but the placement does work better for gaming once you get acclimated to it.

While the keyboard isn't quite as unique, its green LED-backlit keys look gorgeous and we loved the quiet and responsive feel of the buttons. One thing we didn't like about the keyboard—and the whole chassis, for that matter—is its affinity for fingerprints. On the audio front, the speakers are adequate—they're loud and don't distort at full volume—but these run-of-the-mill laptop speakers aren't going to impress audiophiles.

Although the Blade is by no means weak, for a $2,500 gaming notebook, a better GPU would have been nice. Our zero-point GT60, which is cheaper by $1,000, outperformed Razer's laptop in several benchmarks but is admittedly far bulkier and heavier. What you're actually paying for here is the design and portability. Luckily, the Blade delivers on both fronts.

–JIMMY THANG

SPECIFICATIONS

CPU	2.2GHz Intel Core i7-3632QM
RAM	8GB DDR3/1600
Chipset	Intel HM77
GPU	Nvidia GeForce GTX 660M with Optimus Technology
Display	17.3-inch, 1920x1080 LCD
Storage	64GB SATA III SSD, 500GB hard drive (7,200rpm)
Connectivity	Ethernet, HDMI, 3x USB 3.0, headphone, mic, 2MP webcam, Bluetooth 4.0, 802.11a/g/n
Lap / Carry	6 lbs, 11 oz / 7 lbs, 7.2 oz

VERDICT 8

Razer Blade

+ ALIEN Beautiful design; useful, customizable gaming trackpad; large screen.

− PROMETHEUS Expensive; price tag suggests beefier components.

$2,500, www.razerzone.com

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	1,092	1125 (-2.9%)
ProShow Producer 5 (sec)	1,786	1,854 (-3.7%)
x264 HD 5.0 (fps)	12.0	11.3
STALKER: CoP (fps)	32.8	27.6 (-15.9%)
3DMark 11 Perf	2,979	2,405 (-19.3%)
Battery Life (min)	187	164 (-12.3%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point notebook is an MSI GT60 with a 2.3GHz Intel Core i7-3610QM, 12GB DDR3/1600, two 500GB Seagate 7,200rpm hard drives, a GeForce GTX 670M, and Windows 7 Home Premium 64-bit. STALKER CoP tested at 1920x1080 with Ultra settings, Tessellation, and contact hardening.

Don't let its size fool you: Underneath the massive cooling shroud lies a wee 6-inch PCB.

Gigabyte GeForce GTX 650 Ti OC

Kepler's Swan Song arrives with a GTX badge

NVIDIA HAS BEEN popping out Kepler cards like a circus clown car since the company launched its 6-series GPUs in early 2012, and now we finally reach the bottom of the GTX barrel with the $150 GTX 650 Ti. This card slots in right below the $230 GTX 660 and has less of everything—less CUDA, less memory (and a narrower memory bus width), and less PCB.

Though a 6-inch PCB is certainly not small—cough—it makes the 650 Ti the smallest card we've tested in a while. Since this particular board is overclocked, Gigabyte has bolted on a dual-fan cooling mechanism that adds three inches to the card's length. Gigabyte has also doubled the card's RAM allotment over the reference design to 2GB. The extra RAM and cooling adds $20 to the price tag, as well.

In addition to the down-spec'd nature of the GTX 650 Ti, it's also missing two performance-related features: SLI for dual-card gaming and GPU Boost functionality, so the board won't overclock automatically during gaming. To its credit though, Gigabyte ships this card overclocked by 107MHz, and you can crank it up even further via the company's OC Guru II software. Given its massive cooling apparatus, we're sure the card can handle it.

In testing, the little gipper outperformed AMD cards in a similar price range, besting both the Radeon HD 6850 and HD 6870 by small-to-medium margins. However, our target is 60fps at 1920x1200, and when using that standard the card fell short. Granted, we turn everything up to Ultra or High and enable 4x AA, so we could have dialed things down a bit and probably hit 60fps in Dirt 3, Batman, and Just Cause 2. Since we're already at 77fps in Far Cry 2, that would mean possibly reaching our goal in four out of eight games; not bad for such a small video card. The trouble is that the Radeon HD 7850 costs just $20 more, has CrossFire support, and was faster in almost every test we ran, making a final choice slightly more difficult.

If you have a rock-solid $150 budget, we have no reservations recommending a stock GTX 650 Ti, and the Gigabyte version is even better for an extra $20. But if you have even $10 more you should go with the Radeon HD 7850 since it's a faster card. –JOSH NOREM

BENCHMARK

	Gigabyte GTX 650 Ti OC	XFX Radeon HD 6850	AMD HD Radeon HD 6870	XFX Radeon HD 7850	Gigabyte GTX 660 OC
Price	$170	$150	$170	$180 (street)	$230
3DMark 2011 Perf	5,196	3,742	4,478	6,075	**7,093**
3DMark Vantage Perf	20,599	16,006	19,374	24,584	**27,858**
Shogun 2, 1080p (fps)	38.5	32	41	47	**53.7**
Far Cry 2 / Long (fps)	77.4	71	83	103	**119**
Dirt 3 (fps)	53.6	38	40	50	**75.7**
STALKER: CoP DX11 (fps)	28.9	20.9	29.6	34.7	**42.8**
Just Cause 2 (fps)	43.5	31	37	51	**60.4**
Batman: Arkham City (fps)	49	38	46	60	**76**

Best scores are bolded. Our test bed is a 3.33GHz Core i7-3960X Extreme Edition in an Asus P9X79 motherboard with 16GB of DDR3/1600 and an AX1200 Corsair PSU. The OS is 64-bit Windows Ultimate. All games are run at 1920x1200 with 4x AA and all settings maxed out, except for the 3DMark tests, and Shogun 2, which is run at 1080p High settings.

VERDICT **8**

Gigabyte GeForce GTX 650 Ti OC

+ NOLA Quiet; 2GB of RAM; overclocked.

− YOLO No SLI; no GPU Boost; borderline acceptable performance.

$170, www.gigabyte.us

Amazingly light and fast, the iPhone 5 is a worthy upgrade.

Apple iPhone 5

The best iPhone, but not the best smartphone

THE SMARTPHONE world is a vastly different place than when the iPhone 4 hit the scene. Bigger screens, a smoother operating system, faster processors, and the never-ending conga line of flashy new Android phones makes the stage far more competitive than ever before.

With this in mind, Apple needed to re-energize its customers with the iPhone 5 to prove that it can repeat the game-changing trick it managed with the iPhone 4.

The iPhone 5 is amazingly light, and though some have criticized the iPhone's competitors for their toy-like weight, Apple has now joined that crowd, too. But the big change is the 4-inch screen, which is taller but not wider than the iPhone 4's. Apple argues that the design makes it thumb-friendly when using the device one-handed, but we don't entirely buy it. The power button is still a little out of reach, as is anything in the left-hand corner of the screen when using the phone right-handed.

The screen itself is crisp, clear, and bright, with no discernible oversaturation when watching movies or browsing the web. We didn't notice any obvious discoloration, either—some people say the iPhone 4S had a slight greenish tint to it. In fact, the iPhone 5's screen looks a lot better than the iPhone 4S's in a side-by-side comparison, displaying images that looked more true to life than on its predecessor. But the iPhone 5's screen doesn't have the snap and pop that so wowed us on the Samsung Galaxy S III, with its Super AMOLED HD display with superb contrast ratios. If asked to choose which handset we'd like for watching movies, browsing the web, or navigating our car trips, we'd pick the Galaxy S III every time. The HTC One X also bests the iPhone 5 in extreme off-axis viewing.

Folks who say 4.8 inches of screen is too big on a phone haven't played with the Galaxy S III very long—otherwise half those critics would be sold on the larger size within a day. That's not to say the iPhone 5 display is too small, because there are still those folks who believe 4 inches is a hard limit in screen evolution. It's just that if 3.5 inches was the perfect one-handed size, 4 inches is a little too big, and once you've crossed that line, you might as well go bigger, right? At least that's our opinion.

In terms of performance, the overall speed of the iPhone 5 has been increased to match the best that the opposition has to offer.

All its good qualities aside, you can't write a review of the iPhone 5 without touching on the Apple Maps debacle. In case you don't know, Apple's decision to kick Google Maps off of iOS devices has turned into such an embarrassment that the company was forced to apologize and ask for patience. In our opinion, for a lot of people, it'll just be fine. That is, until it Apple Maps tells you to drive off a bridge into the San Francisco Bay like it did with an editor at a sister magazine, or Apple Maps directs you to a hospital that's now a discount store. The total lack of public transit info also adds to the fail here, making Apple Maps the biggest Christmas gift to Apple Haters in a long time.

Is the iPhone 5 the best smartphone ever? If you're an iPhone lover and wholly committed to that platform, it is without question. It's got a larger screen, a superb new design, and generally all the moves required to make it into a worthy evolution.

But as always, we can't get over the price of the iPhone 5—there's simply very little proof that spending all that extra cash brings a tangible benefit. Ultimately, this is an iPhone that underwhelms in terms of specs, but packages it all together in a way that works. The biggest annoyance is that Apple hasn't re-invented anything, even though we're struggling to think how it could.

But that's Apple's job, not ours. This is a company built on enchantment and magic and excitement over raw spec lists—something like a liquid-metal body or second screen on the back would have wowed us far more than "it's a bit thinner." As it is, the iPhone 5 is the minimum users would want in terms of an upgrade. It's a very good phone, but there are plenty of other equivalent devices out there that cost much less and are worth checking out.

Still, it's quite hard to dislike an iPhone, no matter your opinion of Apple's ethos. It's just so simple to use, with a quality screen and admirable design. And it's fair to say, rather obviously, that this is the best iPhone ever made. So, while it's not the best phone we've tested, it's a good effort. —**GARETH BEAVIS**

SPECIFICATIONS

OS	iOS 6
Processor	Dual-core Apple A6
Display	1136x640 IPS
Capacity	16GB, 32GB, and 64GB models
Cameras	1.2MP front, 8MP rear
Video	1080p
Connectivity	Bluetooth 4.0, 802.11b/g/n, HSPA+, CDMA, 4G LTE
Battery	1,400mAh
Dimensions	4.87x2.31x0.30 inches

VERDICT 9

Apple iPhone 5

➕ **PEAR** Fast; thin; beautiful screen.

➖ **COCONUT** Requires new, expensive dongle; atrocious maps.

$200 (16GB w/contract), www.apple.com

Western Digital's first 4TB SATA hard drive is the one to get if you have a lot of data (and money).

Showdown at the 4TB Corral

Two 4TB drives with 7,200rpm spindles go platter-to-platter

Hardcore PC performance fanatics are rarely satisfied. For example, when we were first given 1TB hard drives, we were excited, but wanted 2TB. Then we got 2TB and wanted 3TB, and so on, until we had a 4TB drive in the Lab. When that drive finally arrived, rather than rejoicing, we continued griping because the drive in question was a Hitachi 5K4000, which spins at a lowly 5,400rpm. The capacity was appreciated, but we wanted a drive with 4TB of capacity and a 7,200rpm spindle speed (we actually want a 4TB SSD, but that's beside the point). Now the griping shall cease (for the most part), as we finally have 4TB 7,200rpm drives from Hitachi and WD. These fine specimens are the fastest and largest drives of their kind, so if you're a data hoarder with a need for speed, one of these drives belongs in your rig. –JOSH NOREM

WESTERN DIGITAL RE 4TB

The WD RE 4TB drive is specifically meant to handle an enterprise workload, but don't let that scare you off, as it includes a desktop-friendly SATA 6Gb/s interface. As long as you're running Windows Vista or Windows 7, you should be able to format it into one partition somewhat easily, though you could use it as a boot drive if you're insane. Its enterprise pedigree is evident not only in its RE branding but in its 1.2 million-hour MTBF, or mean time between failure. This means you should be using this drive at least until Apple Maps for iOS has caught up to Google Maps.

Though we appreciate the nod to reliability and certainly abhor flaky hard drives, our primary concern in storage affairs is speed. WD designed the RE 4TB to offer the highest specs possible for a drive of this type, fitting it with a large 64MB buffer and five 800GB platters. Now, this isn't a perfect scenario—we'd prefer a drive with 1TB platters, as is the case with some 3TB drives, such as the Seagate Barracuda 3TB, but right now if you want 4TB and 7,200rpm you get five-platters, so make your peace with it.

In terms of real-world performance, you won't miss that extra platter too much, as this 4TB drive is just a bit slower than the 3TB Barracuda but also slightly faster than several of its 3TB competitors. In sequential-read tests, we saw the WD drive run neck-and-neck with its Hitachi counterpart, with both of them averaging 132MB/s, while the 1TB-per-platter Seagate averaged 155MB/s. The WD Caviar Green 3TB can't hold a candle to these speeds, though, and neither can the 5,400rpm 4TB Hitachi 5K4000, which is not surprising.

Our current Adobe Premiere encoding test writes a 20GB raw AVI file to the drive being tested. The WD RE ran right alongside SSDs in this test, which means our test is past its prime and is gated by CPU and application performance these days. However, it was a tad faster than the Hitachi drive in this test despite their similar write speeds. In our "real-world" PCMark Vantage hard drive test, the WD RE 4TB placed third overall compared to other 3- and 4TB drives. Its performance makes it one of the fastest high-capacity drives we've tested and the fastest 4TB model we've seen thus far.

So it's fast, and it's huge. That must mean the price is equally massive, right? Yes, that is correct! It is hugely expensive at $460, which seems ludicrous. That will be a deal-breaker for many, plain and simple. A data center manager looking to reduce the storage footprint by 33 percent may see value here, but the average desktop user is better served with smaller drives. You can buy 2TB drives for roughly $110, so if you're just looking for fast storage, they'll work just fine. If you need maximum capacity per SATA port, we have no problem recommending the WD RE 4TB, but like any new technology, it's prohibitively expensive at this time.

VERDICT 9

Western Digital RE 4TB

$460, www.wd.com

Hitachi's Ultrastar 7K4000 was the first 4TB drive to roll with 7,200rpm spindle speeds, but these days it has company.

HITACHI ULTRASTAR 7K4000 4TB

The Hitachi Ultrastar 7K4000 4TB made its first appearance in this magazine back in September 2012, when a gaggle of them debuted in the Dream Machine. At the time, they were the only 7,200rpm 4TB drives available, so they fit right in among all the other expensive and hard-to-find components. Now that the dust has settled and the 7K4000 has some company, we decided to put it on the test bench to see how it fares against its only rival in the 4TB category.

Examining the spec sheet, we see the Hitachi is a spitting image of its WD nemesis, and since WD owns the Hitachi storage division now, you would be forgiven for thinking the Hitachi drive is a rebadged WD model. As far as we can tell, however, the drives are physically different. Despite this, both share the same overall design, with five 800GB platters spinning at 7,200rpm, and both have a 64MB buffer as well as a SATA 6Gb/s interface. One area in which the Hitachi has a major advantage is MTBF—it's rated at 2 million hours, which is almost double the 1.2 million hours offered by the WD drive and among the highest MTBF drives available today.

Moving along to benchmark results, we found very few surprises here, at least in comparison to the equally equipped WD 4TB drive. Both drives performed almost exactly the same in our sequential-read and -write tests, coming within 1MB/s of each other. We did see a small difference between the two drives in random-access time, which is strange since they are both 7,200rpm hard drives, but the WD RE drive was more than 3ms faster in our tests at 12.5ms, while the Hitachi drive averaged a very predictable 15.9ms. The Hitachi 4TB also placed at the bottom of the heap in our PCMark Vantage test, with a surprisingly low score that was equaled by the 5,400rpm version of this drive; a truly puzzling performance indeed.

So the drive is a bit slower than the WD RE 4TB, and street pricing puts it at $530, which makes the WD almost seem affordable. Slightly less performance for more money is never a good equation, so if you simply must get a 4TB drive, go with the WD RE 4TB. Otherwise, as we stated earlier, stick with less expensive 2- and 3TB drives for now.

VERDICT 8

Hitachi Ultrastar 7K4000 4TB

$530, www.hgst.com

BENCHMARKS

	WD RE 4TB	Hitachi Ultrastar 7K4000 4TB	Hitachi Deskstar 5K4000 4TB	Seagate Barracuda 3TB	Hitachi Deskstar 7K3000 3TB	WD Caviar Green 3TB
HDTune 4						
Avg Read (MB/s)	132.8	132.7	108.3	**155.8**	119.5	101.5
Random-Access Read (ms)	**12.5**	15.9	19.9	14.9	15.7	15.7
Burst Read (MB/s)	275.5	307.9	**378.3**	325.7	318.7	183.3
Avg Write (MB/s)	131.9	131.1	105.6	**150.7**	118.5	96.9
Random-Access Write (ms)	**12.5**	15.9	18.5	14.9	15.7	15.6
Burst Write (MB/s)	291.6	317.3	**335**	**335.5**	315.6	183.1
Premiere Pro CS3 (sec)	**422**	430	435	455	435	530
PCMark Vantage	6,664	6,125	6,135	6,766	**7,663**	4,910

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel Core i3-2100 CPU on an Asus P8P67 Pro (Rev 3.1) motherboard with 4GB DDR3, running Windows 7 Professional 64-bit. All tests performed using native Intel 6Gb/s SATA chipset with IRST version 10.1 drivers.

Don't assume that you can just leave certain wires dangling on this case: To get all of its features to work, plug in everything you can get your hands on!

NZXT Phantom 820

Good looks, solid installation, a few eyebrow-raising quirks

IF YOU'RE BIG on case lighting—you Cylon fan, you—you're going to absolutely love NZXT's latest Phantom chassis. It's rare to see such attention to detail paid to simple illumination, as with the three separate strands of lighting found on the exterior, interior, and rear of NZXT's Phantom 820. Cooler still, you can manually cycle through a variety of colors for the lights, so as to find the one that matches whatever mood you're in at any given moment.

Of course, a case is more than just its looks—striking as the sharp angles might be on the various windows and grills adorning this jet-black chassis. Installation-wise, stuffing parts into the Phantom 820 is a pretty pain-free process that leaves plenty of room for advanced customizations by skilled system-builders. We're going to assume that describes you, since your average DIY computer crafter isn't likely to buy a $250 ticket to this case's light show. Regardless of its redeeming qualities, it's a wee bit expensive.

The Phantom 820 comes with four 5.25-inch bays, which all lock your optical drives (or reservoirs) into place using handy little plastic mechanisms instead of the screws we oh-so-hate. And we're giving special mention to the Phantom 820's drive covers, which lock onto the sides of the chassis using a spring-loaded, front-facing switch instead of those often-finicky plastic tabs—you know what we're talking about.

The case's six hard drive bays use trays to secure your storage in place. They all pull out on the right side of the chassis, but with a caveat: Two of them can also be accessed by first pulling out a compartment on the chassis's left side. We don't mind it much that you have to pop off the nonstandard side of the case to access the drive bays, but it would have been nice to be able to access all the drive bays from the case's left side, as well.

While we love the case's built-in cable management, including its jaw-dropping 10 rubberized holes for keeping cables organized and tidy, we're a little displeased by how NZXT neglects to tell users what all of the case's supplemental cables are actually for.

For example, a built-in fan controller on the top of the case (across from its two USB 3.0 ports and four USB 2.0 ports) allegedly controls fans you plug into certain connectors. We couldn't get it to work with any combination of fans we hooked up, nor does it appear to work with the default case fans already wired on the Phantom 820. And don't just assume that the manual's instruction of "plug in the Molex connector" is all you need to do to get the case's full light setup working: You have to connect your front-panel headers *and* a supplementary SATA connector for the full, controllable effect.

NZXT's Phantom 820 is a strong contender for your attention and wallet, especially if you prefer looks over functionality. At this price, however, you should be looking for a case that nails both categories flawlessly: The Phantom 820 is close, but not tiptop. –**DAVID MURPHY**

VERDICT 8

NZXT Phantom 8200

+ NUMBER SIX Gorgeous chassis with eye-catching, customizable lighting across three separate zones.

− NUMBER FIVE Wiring and instructions a bit tricky to figure out; finicky fan controller.

$250, www.nzxt.com

Two rubber strips between the heatsink and fan do a good job of taming the acoustics.

Phanteks PH-TC90LS

Small and quiet

ALMOST EVERY CPU cooler we receive nowadays is some massive tower that loves consuming every square-inch of chassis space. Because we've been inundated with these hulking behemoths, it's refreshing to see a low-profile cooler such as Phanteks' PH-TC90LS. At 3.75x3.75x1.77 inches, this cooler makes the Intel stock cooler look tall and should fit the snuggest of HTPC builds.

The PH-TC90LS features a single 9.2cm fan and nickel-plated aluminum fins on top of a square copper base. Aesthetically, it's a no-frills design.

Installing the cooler is, for the most part, pretty straightforward. The four corners of the PH-TC90LS have screw holes that let you easily mount the cooler onto the mobo. The fan uses four rubber pins that allow two mounting clips to attach the fan to the heatsink. Also included are two adhesive-backed rubber strips to stick between the fan and heatsink to dampen noise.

We initially had some issues getting enough mounting tension for the PH-TC90LS when we tried to install it on our LGA2011 mobo. It took us three attempts and some major cranking before the Phanteks cooler would perform as it should. When we tried mounting the PH-TC90LS on our LGA1155 test bed to see if it was any easier there, the cooler installed without a hitch using the included backplate. Other than this headache, installation was relatively painless. Phanteks could have made the process even easier by having the whole cooler all assembled out-of-the-box like Intel's "stock" 2011 cooler, the Thermal Solution RTS2011AC. (We put the word stock in quotes because 2011 Sandy Bridge-E CPUs don't actually ship with coolers.)

While we generally test to see how well CPU coolers perform on our overclocked Sandy Bridge-E CPU, low-profile coolers such as the PH-TC90LS aren't meant for extreme overclocking. To make allowances, we reset our thermal-test PC to its stock 3.3GHz clock for our benchmarks.

Compared to Intel's RTS2011AC cooler, the PH-TC90LS wasn't as cool. When both coolers were run in the motherboard's Performance mode, Intel's stock part idled with a 7 degree advantage. The differential only increased under heavy load. Here, the Phanteks went up to 77 C, which isn't bad, but was noticeably warmer than Intel's cooler by about 13 degrees. However, these temps are still perfectly suitable for HTPCs and, more importantly, the CPU didn't throttle.

One area where the PH-TC90LS really impressed us was in the acoustic department. Those two noise-dampening strips really did their job. We can't say the same about Intel's cooler, which was far louder under load.

While the PH-TC90LS isn't going to win any thermal awards, its amazingly small form factor makes it a great choice if you're looking to build a tiny, quiet HTPC. –JIMMY THANG

VERDICT 8

Phanteks PH-TC90LS

+ PRINCE OF PERSIA (THE GAME) Quiet; super-small form factor will fit tiny HTPC chassis.

– PRINCE OF PERSIA (THE MOVIE) Intel's stock cooler cools better and is slightly cheaper.

$30, www.phanteks.com

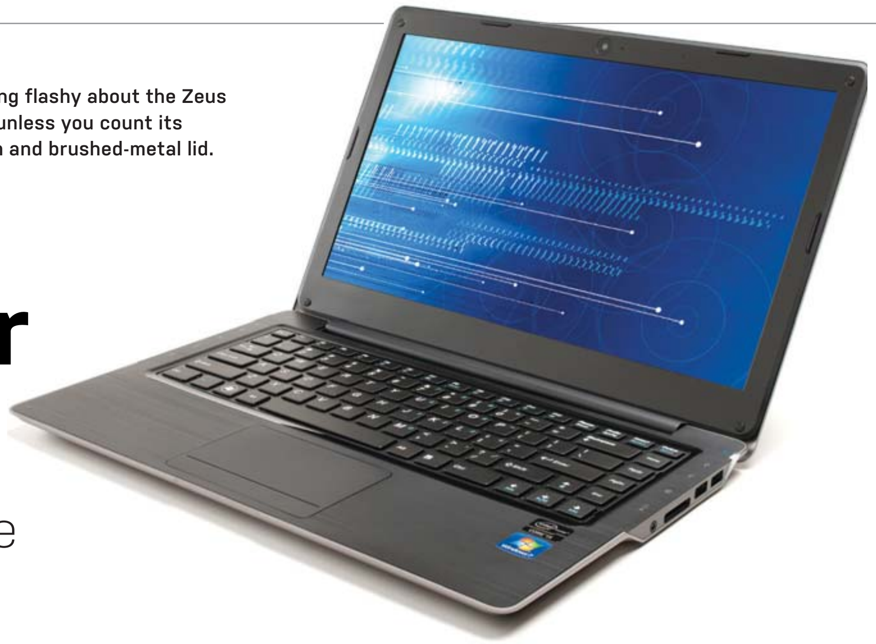
SPECIFICATIONS

Dimensions H x D x W (inches)	3.75 x 3.75 x 1.77
Weight	9.6 oz
Heat Pipes	3
Stock Fans	1x 9.2cm 4-pin PWM
Socket Support	Intel LGA1155/1156/2011

BENCHMARKS

	Phanteks PH-TC90LS (Performance mode)	Intel RTS2011AC (Performance mode)
Ambient Air	20.5	21.9
Idle Temperature	45	**37**
Burn Temperature	77	**64.1**
Burn - Ambient	56.5	**43.3**

All temperatures in degrees Celsius. Best scores bolded. All tests performed using an Intel Core i7-3960X at 3.3GHz, on an Asus Sabertooth X79 motherboard with 16GB DDR3/1600, in a Thermaltake Level 10 GT with stock fans set to Low.



There's nothing flashy about the Zeus M2's design, unless you count its glossy screen and brushed-metal lid.

CyberPower Zeus M2

The more-affordable ultraportable

IF IT'S TRUE that Ultrabooks aren't meeting sales expectations because of high prices, CyberPower is making moves in the right direction by offering a trio of 14.1-inch models that break the $1,000 barrier. One of those is the Zeus M2, which rings in at $850. That's nearly half the cost of the Lenovo X1 Carbon we reviewed last month. So what, if any, features and performance are sacrificed in the service of money savings?

It's pretty clear that CyberPower cut some of its costs on materials and construction. The Zeus M2 is nearly all plastic except for its brushed-metal lid. The body is not super rigid, exhibiting flex in the base when the notebook is held by one corner, and some mushiness under the keyboard. But the build doesn't seem flimsy and the hinge feels solid. The keyboard and touchpad are in keeping with the budget motif—strictly serviceable, but thankfully free of any major nuisances in our testing. Similarly, the screen is an unremarkable TN panel with a 1366x768 resolution and a glossy finish. All in all, the overall quality is what you'd expect from the price tag.

But by keeping design flourishes to a minimum, CyberPower is able to outfit the Zeus M2 with a respectable loadout of internal components that doesn't stray far from many pricier configs. For instance, at 1.7GHz, its i5-3317U CPU is clocked just 100MHz lower than the X1 Carbon's proc (the same proc found in our zero-point, incidentally). The M2's 120GB Intel SSD is just 8GB shy of the X1's—what's more, the M2's drive achieved sequential reads that were 21 percent better than the X1's drive and sequential writes that were 10 percent better in CrystalDisk Mark. On top of that, the M2 offers 16GB of RAM to the X1's 4GB. The M2 also boasts a competitive array of ports, including full-size Ethernet and HDMI ports, two USB 3.0 ports (along with one USB 2.0), and a media card reader.

In our benchmark tests, the Zeus M2 held its own, performing even better against our zero-point rig than last month's Carbon X1. Our battery rundown test was another story. Here, the M2 conked out in less than four hours. Since long battery life is one of the tenets of the Ultrabook mandate, this is a notable failing.

Still, we have to give CyberPower credit where credit is due. The M2 might fall short in the style and battery-life categories, but it succeeds in key ways that are crucial to the Ultrabook brand, by offering a thin and light portable with flexible features and competitive performance at a very competitive price. Budget buyers will be well-served by this device. –KATHERINE STEVENSON

VERDICT 8

CyberPower Zeus M2

+ COSTCO Solid performance and features for a competitive price.

– WALMART Budget styling; disappointing battery life.

$850, www.cyberpower.com

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	840	960 (-12.5%)
Photoshop CS3 (sec)	102	105 (-2.9%)
ProShow Producer (sec)	1,113	1,201 (-7.3%)
MainConcept (sec)	1,904	2,047 (-7%)
Quake III (fps)	430.8	438.5
Quake 4 (fps)	73	68.5 (-6.8%)
Battery life (min)	315	226 (-28.3%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point ultraportable is an Intel reference Ultrabook with a 1.8GHz Intel Core i5-3427U, 4GB of DDR3/1600 RAM, integrated graphics, a 240GB SSD, and Windows 7 Home Premium 64-bit.

SPECIFICATIONS

CPU	1.7GHz Intel Core i5-3317U
RAM	16GB DDR3/1333
Chipset	Intel HM77
Display	14.1-inch1366x768 LED-backlit LCD
Storage	Intel 120GB SSD
Connectivity	Two USB 3.0, USB 2.0, headphone/mic, 9-in-1 media card reader, Bluetooth 4.0, 802.11n, webcam, Ethernet, HDMI
Lap / Carry	3 lbs, 6.9 oz / 4 lbs,3.7 oz

Osmium is actually an element in the platinum family that's used in ballpoint pen tips.

Gigabyte Osmium Aivia Mechanical Keyboard

Easy on the fingers but not on the wrists

GIGABYTE HAS finally stepped into the mechanical keyboard ring with a fully loaded Cherry MX gaming keyboard named the Osmium. Though the keyboard is stuffed with useful features, it has a few faults that prevent it from taking up permanent residence under our fingertips.

The build quality is excellent, giving the Osmium a sturdy and well-made feel with crisp, responsive keys. We like the matte-black finish, as well, because it looks badass and repels fingerprints. The stars of the show are the Cherry MX Red switches that lie underneath the keys and are known for their quiet and smooth typing experience compared to their clickier Blue or Black switch brethren.

The keys are backlit with bright-blue LEDs, the intensity of which can be easily adjusted via a rubber scroll wheel at the top of the keyboard. You can also depress the scroll wheel to turn off the backlighting, a handy feature if you and your rig are roommates. Adjacent to the backlighting wheel is a volume control wheel that allows you to adjust or turn off the volume on your headphones or speakers.

Five customizable macro buttons lie just above the F1–F5 keys for easy access, and are easily programmed with Gigabyte's GHOST macro software. You can store up to 70 macros on the board's 32K of onboard memory, so you can plug your keyboard into any computer and have your macros handy—a cool feature indeed, even if we're not sure we'd ever use it. You can also record up to five different macro profiles.

The Osmium features a detachable palm rest that's almost as large as the keyboard itself, but we actually appreciated its full-size footprint. There is a problem, however, in that the palm rest is angled upward, so when the keyboard lays flat on your desk, the two parts are not flush, causing the keyboard to flex when you type, which we found annoying. However, when the keyboard was raised up via two sets of "legs" underneath it, the board and palm rest were as snug as a bug.

The Osmium is sprinkled with a few other features that gamers will appreciate, including a convenient USB 3.0 port on its right-hand side that's useful for USB hard drives. Headset and microphone inputs are next to the USB port, which could cause problems if your USB stick is extra wide. The Windows key can be disabled, making it RTS friendly.

In the final tally, the Osmium is a full-featured keyboard with comfortable, responsive keys and a lot of useful tweaks for gamers. We didn't like the flex that occurred when the keyboard was flat on our desk, but thankfully it was fixable by extending one set of the keyboard's legs. The board is also a bit expensive at $130—the same price as our latest Dream Machine board, the Corsair K90. We prefer the K90, although it admittedly lacks inputs for headphones and USB 3.0. Still, we'll take comfort over features any day.
–CHRIS ZELE

VERDICT 8

Gigabyte Osmium Aivia Mechanical Keyboard

+ THE GOOD, THE BAD AND THE UGLY Adjustable backlighting; USB 3.0 pass-through; onboard memory for macros; comfortable, responsive keys.

− SUCKER PUNCH Palm rest flexes too much; USB port next to headphone jack.

$130, www.gigabyte.com

Menus overlap one another in a console-ready attempt to fit everything into the middle of the screen.

Borderlands 2

The shoot-and-loot format (almost) perfected

WE LOVED the original Borderlands for all of its first-person-shooter action, varied gameplay (there was shooting people *and* driving over them, for example), and lots and lots of guns. In fact, the official claim from developer Gearbox Software was that the game offered 16,164,886 guns, which is almost as big as Gordon Mah Ung's personal collection. Despite its glorious carnage, it also had a few glaring problems, foremost of which was a horrendous PC port that was so bad Gearbox publicly apologized (via a love letter written by the game's annoying NPC Claptrap) and promised to make it right with Borderlands 2.

There's good news, kids: Gearbox kept its word and has more than made up for its past transgressions with this awesome sequel, which goes above and beyond what we even thought possible from a franchise like Borderlands. The sequel is better than the original in every way imaginable, making it a must-have for PC gamers and an easy contender for Game of the Year.

Like the first game, the sequel takes place on the mythical planet of Pandora—and once again you are a rogue vault hunter determined to unlock a secret relating to some ambiguous mysterious Vault. As before, the story isn't terribly important, but it's definitely more tolerable thanks to a liberal infusion of humor and memorable characters, such as the friendly Ellie and the too-hip annoyathon named Tiny Tina.

Claptrap and Scooter return as your BFFs, too, and they are much improved, but neither is as memorable as the game's antagonist—a megalomaniac named Handsome Jack who tells you as soon as the game begins that he is buying a pony made of diamonds and naming it after you, "Piss for Brains." Jack keeps up the wisecracks throughout the 30-plus-hour first play-through, and by the time the final battle arrives, you are itching to pile-drive his face into the ground. This intense desire to kick his ass is a testament to Gearbox's pitch-perfect writing, as it never gets old and is always funny. Even the bad guys scream funny sayings like, "I'm going to wear your head like a condom!" as they rush toward you, though at times there's so much chatter you can't hear mission details as they pop up on your intercom.

Just like the first game, you have to choose one of four character classes—Commando, Siren, Gunzerker, or Assassin—each with a unique special ability; we liked Commando and its upgradeable Sabre turret the best.

One of the biggest sins Gearbox committed in the previous game was its console-centric HUD, and it has largely redeemed itself this time around, but not completely. You can now adjust FOV and HUD size via sliders, and everything is mouse-and-keyboard friendly, but the weapon- and perk-management screens are still

All of your firearm fantasies are fulfilled in Borderlands 2, with shotguns that shoot acid, rockets that shoot homing missiles, and grenades that explode into more grenades.

Gunfights are nonstop and intense, and often end with the bad guy exploding and littering the battlefield with his remains.

Each of the four classes has a special ability, and here we see the Commando class's Sabre turret go to work on a feral Bullymong.

more difficult to deal with than they need to be. For example, on the level-up screens where you assign skill points to different strengths there are three columns, with only one fully visible at a time, so you have to click over to one to make it pop up, but we didn't even see the screen on the left because it's mostly covered up by the stats of whatever current skill you are examining. Luckily, we were able to re-spec our character for a small price, but there's no reason why the menus need to be squashed together like that on a PC, which packs more pixels.

The layout of these screens is important because you are constantly managing your inventory, trying to figure out which weapon to use, which grenade mod is best, which relic to try out, and which class mod fits best with your current situation. Like the first game, the possibilities are seemingly endless as the game randomly mixes and matches stats and capabilities for weapons and gear into a dizzying array of options. You can have guns that spit corrosive goo, a sniper rifle that is also a Gatling gun, grenades that suck people into a vortex before exploding, and much more, and all of them are fun to use. Gearbox puts the weapon count this time around at "87 bazillion," which sounds accurate to us. Sadly, we never saw a legendary "orange" weapon the entire game, and the golden chest containing epic loot at Sanctuary never opened for us since in order to have a key you needed to have either pre-ordered the game, bought the DLC, or snagged a free key on Twitter. Though it's clever marketing, a way to earn a key in-game would have been appreciated.

The final pieces of the puzzle are co-op and performance, and Gearbox has pulled these off quite nicely. You can easily add any of your Steam friends to your current game or join a random game with people of a similar level as you. Squadmates can heal one another and collectively decide who gets what loot according to their needs. It's all very slick and well-implemented, and the preferred way to play through the more difficult levels. Performance is also quite good at 1080p with everything turned on, but bump the resolution to 2560x1400 and Borderlands 2 will require a beefy rig to run. The game was unplayable at times at 2560x1440 with a GeForce GTX 670 with all PhysX effects on High, but played fine on a GTX 690 (imagine that). Though taxing on your GPU, the PhysX effects are totally badass. Downed enemies leave pools of blood on the ground, and particle effects explode constantly, raining down shrapnel during battles. We've never seen PhysX look this good in a game, or add such immersion, making it a must-have feature here.

Though it's not without flaws, Borderlands 2 packs so much awesomeness into its virtually endless campaign (you can play the very long full campaign with side missions twice for each character class) we largely didn't mind the small annoyances. It's entertaining from beginning to end, and with the four character classes, True Vault Hunter mode for the hardcore, and online co-op, we'll be playing this game for a long time to come. –JOSH NOREM

VERDICT 9 KICK ASS!

Borderlands 2

+ GRUMPY CAT Amazing PhysX effects; nonstop action; hilarious writing; lots of replayability.

– CEILING CAT Menus still squished; monster rig required for high-res gaming.

$60, www.borderlands2.com, ESRB: M

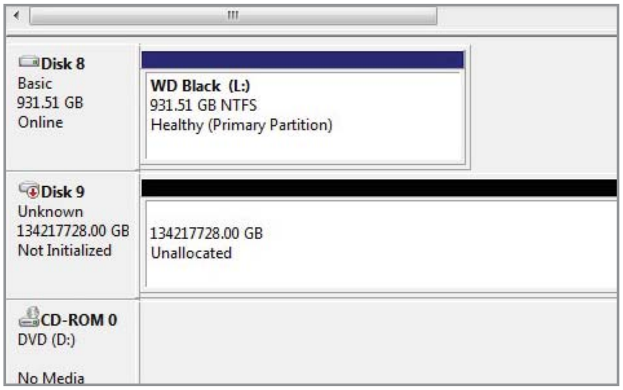
LAB NOTES

JOSH NOREM **EDITOR**

DOA Hardware

Don't let it fool you

THIS MONTH, I participated in several pitched battles with storage devices, and unfortunately came out the loser in all of them due to one fundamental principle of PC troubleshooting: You cannot "fix" faulty hardware, period. It's a massive waste of time to try to configure or tweak your way around a broken component. As power users, we always want to believe an easy fix is right around the corner, but sometimes it just isn't. A classic example is a dead Internet connection. We'll fiddle with Windows forever, try Combo-Fix, release/renew, reboot the router, and waste hours of time before trying a different router. Been there, done that. This month, it was a hard drive that came out of the box dead and identified itself as the biggest hard drive in the world (see image on right). I swapped SATA cables, tried a USB enclosure, but it was dead, Jim. The lesson is simple: Don't rule out faulty hardware in your troubleshooting flowchart.



Jimmy Thang
Online Managing Editor

I'm a big League of Legends player. I recently tried playing Valve's equivalent MOBA, DotA 2, to get a fresh take on the genre, but I'm not feeling it. This is odd, considering I'm a huge Valve fanboy and generally love every direction it takes. Sure, you can argue that it's the deeper game, but to me, DotA 2 is just not as streamlined or fun.

Katherine Stevenson
Editor-in-Chief

We've been hearing so much about Windows 8 and how it's going to be a game-changer on portables (or so Microsoft hopes), it's about time we see for ourselves what all the fuss is about. Next month, I'm going to have my hands on some actual shipping hardware. I'm most curious to see if I become convinced that a notebook is made better by a touchscreen. Right now, I'm skeptical.

Gordon Mah Ung
Deputy Editor

With the move to Windows 8, we'll take a look at revising our system benchmarks. My thought: We're kicking Batman: Arkham City out of the Bat Boat. I could deal with its limited activations, but it's the first game I've seen to have limited deactivations. Yes, that's right. After 10 uses total, you have to buy a new copy. Goodbye, Dark Knight. Burn in hell!

Chris Zele
Intern-421

I've spent the last few weeks playing through Dishonored and it's easily one of my favorite games of the year. As a matter of fact, I like it so much that I've already beaten it twice! Stay tuned for my review next month. I can't wait to show you guys screen caps of some of the insane kills I've gotten.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> New Drive, Which OS?
> The Verdict on Lightroom
> Accused of Tablet Bias

New SSD—Which OS?

Thanks for your feature on Windows 8's upcoming release (November 2012). While I wouldn't plan on upgrading, the question I'm left with is whether, upon buying an SSD to replace my aging physical drive, should I install Windows 8 or put back Windows 7? I'm sure there's a lot which is subjective in the answer, but I'm just looking for the *Maximum PC* consensus.

—Dudie Silberman

EDITOR JOSH NOREM RESPONDS: That's a tough call, Dudie, but if it were our home machine we'd stick with Windows 7. The reason is that Win7 is a known quantity, runs well, and there's no learning curve. By contrast, Windows 8 isn't a slam-dunk, must-upgrade-at-launch product, for two reasons: The first is that it's a new OS from Microsoft—need we say more? Let's just say the company doesn't have a stellar track record when it comes to OS launches (we are still seeing a therapist for what we went through with the Windows Vista launch). Second, we're not big fans of the Metro interface on the desktop and we do miss the Start button. That said, we've been using Windows 8 at the office for months now and it has grown on us, but not enough to warrant an immediate upgrade. So to summarize, stick with Windows 7 for now but we think you'll eventually want Windows 8, so we recommend taking advantage of the $40 upgrade price that's good until January 31, 2013. Just buy it and stick it on your shelf until SP1 comes out, then install it.

Your Lightroom Yardstick Is Too Long

I think the "yardstick" Gavin Farrington used to measure Lightroom 4.0 (November 2012) needs to be changed. Lightroom 4 isn't CS6 and isn't meant to be. On Adobe's website, the price for the full version of Lightroom 4 is $550 cheaper than the price for the most basic version of CS6. The two programs are meant to complement each other and not replace each other. To say that Lightroom has failed if you need to open up Photoshop to finish a job is missing the point. That's like reviewing an antivirus program and then saying it has failed because you still need a separate firewall, or reviewing an OS and saying it has failed because it requires Internet or phone activation. Times change and measurements need to change, as well. Is it important to mention that there are things Photoshop can do that Lightroom can't? Definitely. But Lightroom is now in its fourth iteration and fills a niche in which it is the undisputed market leader. Time to move that yardstick, Mr. Farrington!

—Howard "Goose" Akuma

DEPUTY EDITOR GORDON MAH UNG RESPONDS: Blame me, not Gavin, as I'm the one who incepted that idea into his head. Gavin is a professional, award-winning wedding photographer and knows the limits of Photoshop. I'm also a big fan of Lightroom and the joy I get from it is directly related to the time I never have to launch Photoshop. Adobe knows this, too, and that's why it continues to add additional features to Lightroom. Our primary complaint against Lightroom 4.0 is its confusing performance quirks. I know what speeds up Photoshop: disk I/O, more RAM, and higher clock speeds. After years of using Lightroom, I still can't figure out what floats its performance boat.

Inconsistencies with Ultra Burner

Looking at your Ultra PC on page 96 of the December issue, I see you list the Blu-ray burner as being a Lite-On model, but the picture clearly shows a Plextor drive. What gives?

—Robert Wagner

EDITOR-IN-CHIEF KATHERINE STEVENSON RESPONDS: You're correct, Robert. While we had previously recommended a Plextor drive for that build, our final verification of the parts list revealed that the Plextor drive was no longer available, thus we changed our recommendation to the Lite-On drive. Unfortunately, we were unable to take a new picture before the issue had to be sent to the printer.

Maximum Bias

Really? You had to pit the iPad 3 against the Nexus 7 (November 2012)? And to top it off, you named the Nexus 7 the *winner* after lauding the iPad at the beginning of every category. I've heard you guys describe your "Maximum" *raison d'etre* over and over again. "Sure it's $5,000, but this is *Maximum PC*!" Cost be damned. So, to even things out and obscure your obvious bias for the Mini Cooper of the tablet world, I want to see you pit the last Dream Machine (with giant monitors, and all) against a

↘ submit your questions to: comments@maximumpc.com

Core i5 rig rocking a single 1280x800 screen. Oh yes, and you *have* to declare the i5 rig the winner because... well, it just does a pretty neat job as a web/email rig for half the cost. 9/Kick Ass!!!! Maximum BIAS.

—Paul Threatt

EDITOR JOSH NOREM RESPONDS: The iPad is a formidable tablet, as we noted in our review (June 2012) where we awarded it a 9/Kick Ass. But so is the Nexus 7, which also earned a 9/Kick Ass (October 2012). Both are the best tablets in their class—no question. To address your point about our reason for being, it's never been "money is no object." We appreciate the über-expensive PCs for one reason and one reason only—because they kick ass. They are faster than other PCs, demonstrate better attention to detail, better components, better everything, in other words. We don't mind price—you are correct about that—but a product has to justify price with performance, and that's backed up by benchmarks. So, just because the iPad is bigger and more expensive doesn't make it automatically better than the Nexus 7. The Android tablet is half as expensive as the iPad, while offering the same performance, and allowing us more flexibility to customize the OS, install apps, and manage our files. If we have two PCs, or tablets, that offer roughly the same level of performance, but one costs twice as much as the other one, we will always give the nod to the less expensive machine. We are not the *Maximum PC* you think we are if you think we just look at the price tag and give an award.

Upset AMD Fan(boy)

Just got the December magazine today. Quite disappointed to see how much AMD was ignored. I don't want to start a bogus AMD/Intel war here, but why is the Intel i7 worshiped so much? The new AMD FX Bulldozer series is absolutely amazing. I'm currently running the quad-core bulldozer and I love it. A majority of the kids I went to school with used i7s and all they did was complain about how hot it ran or how many times things kept freezing.

—William Bakunis

DEPUTY EDITOR GORDON MAH UNG RESPONDS: We're quite disappointed too—in Bulldozer's inability to take the fight to Intel's Core i7. The truth is, Bulldozer can barely take the fight to a Core i5 chip. The market works best when there's competition, and right now there is no competition at the high end. If AMD could get an eight-core chip out there that could school Intel's Core i7-3960K, you can bet your sweet tuchas the $1,000 3960K would come down in price overnight. As to college kids' computers freezing or running hot, my advice is to stop downloading porn using those high-bandwidth university connections. Oh, and by the way, AMD is actually sorta back in the fight—flip to this month's Tech Preview on page 25 to see its new Vishera chip in action.

[NOW ONLINE]

HOW TO INSTALL DAYZ

DayZ is widely considered one of the best mods of all time. Over 1 million people are having a blast playing the zombie-killing game. But while DayZ is undeniably fun, it can be a real pain to install. Our in-depth install guide will arm you with everything you need to get started in the zombie apocalypse. bit.ly/SWZ3rg.

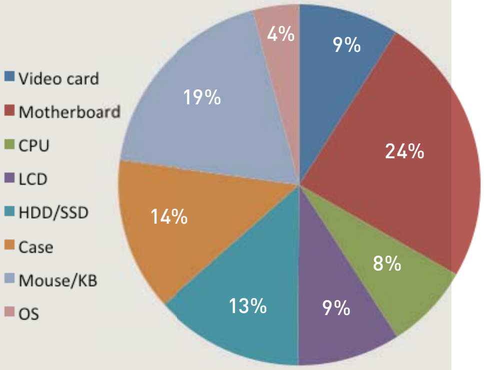
Facebook Polls

Most-Anticipated Hardware of 2013

We poked our Facebook fans to ask them what technology they were dreaming of for 2013. Here's a sampling of what they are looking forward to the most:

Brendan Reece Sullivan: A way to remove Metro from Windows 8
Ryan Langston: Price cuts on last year's tech
Andrew Wilson: Price drops on SSDs
Chad Hershey: Hardware-based soundcards
Sandro Brasi: 4GHz CPUs
John Croft: Ivy Bridge-E
Jacob Stanberry: Windows 8 SP1
Gregory Loflin: Fiber Internet to my house
Florian Prat-Vincent: OLED monitors
Adam Dodson: High-capacity SSDs
Brad Moan: Google Glass
Timothy Horton: Haswell
Jacob Williams: 4TB drives
Ron Malcolm: Wi-Fi 802.11ac standard
Brendan BeHanna: AMD 8000-series GPU

What Is the Oldest Component in Your System?



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THE BUILDS

BUDGET

INGREDIENTS

PART		URL
Case/PSU	Rosewill R218 w/ 450W PSU	www.rosewill.com
Mobo	Gigabyte GA-970A-UD3 ATX	www.gigabyte.us
CPU	AMD Phenom II X4 965 BE	www.amd.com
Cooler	Stock AMD cooler	www.amd.com
GPU	Asus Radeon HD 7770 1GB	www.asus.com
RAM	4GB (1x 4GB) Corsair Vengeance DDR3/1333	www.corsair.com
Optical Drive	Lite-On iHAS224-06 DVD/CD writer	www.lite-on.com
SSD	OCZ 128GB Vertex 3	www.ocztechnology.com
Hard Drive	1TB Seagate Barracuda	www.seagate.com
OS	Windows 7 Home Premium 64-bit	www.microsoft.com

Approximate Price: $678

THE BIGGEST CHANGE to the Budget build is the addition of a Vertex 3 SSD from OCZ. It pushes our budget up a tad—$68 to be exact—but since some of the other prices had dropped slightly we felt it was easy to justify the expenditure. Besides, 128GB SSDs are ridiculously cheap now at $0.70 per gigabyte, and it's enough room for your OS and desktop files. To store everything else, we still recommend the 1TB Seagate Barracuda. We considered swapping out the Radeon HD 7770 GPU for the new GeForce GTX 650 Ti but the extra $50 didn't seem like a good trade-off since we already spent a little extra on the SSD.

BASELINE

INGREDIENTS

PART		URL
Case	Fractal Design Define R4	www.fractal-design.com
PSU	Corsair HX650	www.corsair.com
Mobo	Gigabyte Z77X-UP4 TH	www.gigabyte.us
CPU	Intel Core i5-3570K	www.intel.com
Cooler	Cooler Master Hyper 212 Evo	www.coolermaster.com
GPU	Gigabyte GTX 660 Ti Power Edition	www.gigabyte.us
RAM	8GB Patriot Gamer DDR3/1600	www.patriotmemory.com
Optical Drive	Samsung SH-222BB	www.samsung.com
SSD	128GB Samsung 830 Series	www.samsung.com
Hard Drive	3TB Seagate Barracuda	www.seagate.com
OS	Windows 7 Home Premium 64-bit	www.microsoft.com

Approximate Price: $1,350

THE BIG CHANGE this month on the Baseline front is a switch from the standard GeForce GTX 660 model back to the Gigabyte GTX 660 Ti Power Edition. It was easy to justify spending a little more cash since prices have fallen across the board, especially for storage (both rotating and NAND flash). In fact, we thought about bumping the SSD capacity up to 256GB, as those drives are just starting to become semi-affordable, but they're not quite in the sweet spot just yet. In 2013, though, 256GB SSDs will reach the $0.50-per-gigabyte level, and become the baseline in all of our builds.

PERFORMANCE

THE PRICE for parts in our Performance rig actually went *up* this month, if you can believe that, and we also upgraded the SSD, making this system a bit more expensive than it was previously. Despite the price increase, it's still about half the price of our Ultra build, which will be returning next month.

First, we switched from an overclocked Asus GTX 670 DirectCU II TOP to a standard GeForce GTX 670 because the price difference has grown to $90, and we didn't think the extra 100MHz overclock and extra cooling was quite worth the extra expenditure. We also upgraded our boot drive SSD from the venerable Samsung 830 Series to the new-and-improved 256GB 840 Series because the price is surprisingly reasonable at $204. While we tested the Pro version of this SSD and found it to be one of the fastest we've ever benchmarked, we're actually going with the non-Pro version here, which is more reasonably priced. We haven't tested the non-Pro version, but the drives are extremely similar, so we have no problem taking this leap of faith. We're also holding steady with Windows 7 for now.

For our complete Best of the Best list of recommended components, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART		URL
Case	NZXT Phantom 410	www.nzxt.com
PSU	Corsair HX750	www.corsair.com
Mobo	Asus Sabertooth X79	www.asus.com
CPU	Intel i7-3820 @4.7GHz (overclocked)	www.intel.com
Cooler	NZXT Havik 120	wwww.nzxt.com
GPU	MSI GeForce GTX 670	www.msi.com
RAM	16GB Corsair Vengeance DDR3/1600	www.corsair.com
Optical Drive	LG WH12LS39 BD-R burner	www.lg.com
Solid-State Drive	256GB Samsung 840 Series	www.samsung.com
Hard Drive	Seagate Barracuda 3TB	www.seagate.com
OS	Windows 7 Professional 64-bit	www.microsoft.com

Approximate Price: $1,890

SUGGESTED PAIRINGS

Kick-ass peripherals for your new rig

SPEAKERS
Corsair SP2500
$205, www.corsair.com

KEYBOARD
Razer Black Widow
$130, www.razerzone.com

MOUSE
Cyborg R.A.T. 9
$100, www.cyborggaming.com

GAMING HEADSET
Corsair Vengeance 1500
$100, www.corsair.com

AIR COOLER
Phanteks PH-TC14PE
$90, www.phanteks.com

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